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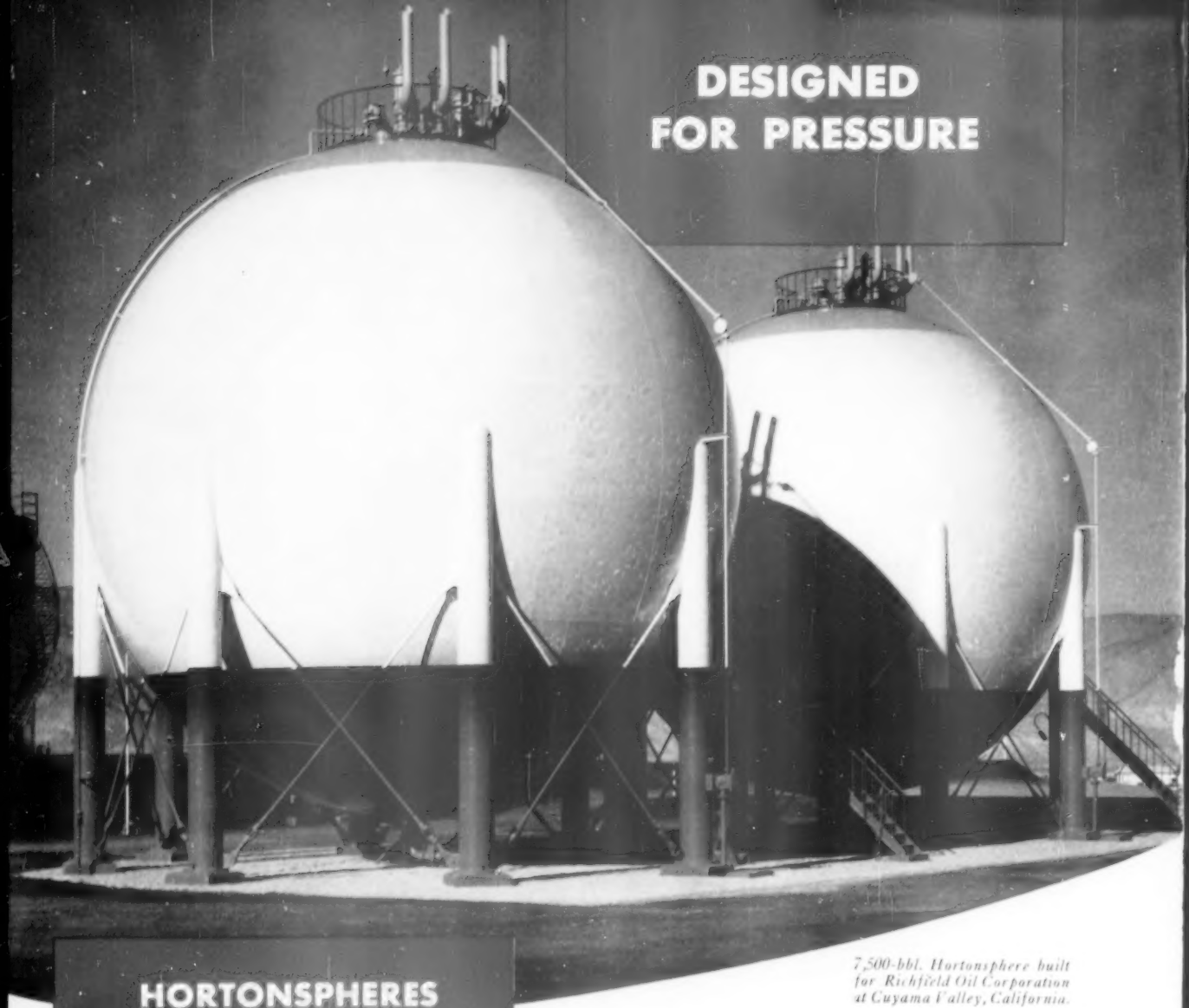
PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 AUGUST 2, 1954



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AUGUST 2, 1954 VOL. 53 NO. 13

OIL IN THE NEWS . . .

Louisiana Moves its Border 3 Leagues Out From Offshore "Coast Line" 54
Deep Rock Discloses New Idea Petroleum Marketing 55
Important Mississippi Strike Gages 748 Bbl. a Day 55
Texas Eastern Asks FPC Approval for Conversion of Little Inch 56
Quarterly Survey Shows Octane Ratings Still Climbing 57
First Ammonia Plant Using Catformer Gas Now in Operation 58
Construction Begins on 195-Mile Badger Products System 59
Arapahoe Ready to Let Contract on Rocky Mountain Crude Outlet 59
Work Begun on Line Which Will Move Fosterton Crude to St. Paul 60
Oklahoma Cut Emphasizes "Premium" Paid for Poor Crudes 61
Frontier Signs With Wyco for Use of Casper-Denver Line 62
Big Horn Basin Test Finds 100 Ft. of Saturated Sand 62
Northern Natural Hearing for North Dakota Line Postponed 62
North Dakota Orders 80-Acre Spacing for Two Oil Fields 63
El Paso Near Decision on Option to Acquire Colorado-Western 63
First Contract for Natural Gas in Pacific Northwest Signed 66
Trans-Canada Contract Let to Three-Company Combine 68
Seaboard Confirms Light-Gravity Crude Discovery South of Pembina 70
Versatile New Logging Unit Offered to Industry on Rental Basis 73
Hunt Oil Interests Acquire Assets of Trinity Drilling Co. 74

TECHNOLOGY AND OPERATION . . .

[1]Deere's Three-Process Ammonia Plant Soon to Be on Stream 78
Prevention of Sucker-Rod Failures by Electronic Inspection 82
Pneumatic Tube Speeds Communication at Baton Rouge Refinery 85
By C. H. Hall
Use of Silicones in Pipeline Operations 87
[2]Pilot Water Flood Automatically Controlled 89
[3]Calstate Refining Builds First Commercial Hyperformer 91
How Photogrammetry Aids Pipelining 93
[4]Stratigraphic Problems of Warrior Basin 95
By Rizer Everett
[5]How British-American Plans Deep Well Drilling 98
When Does Pressure Maintenance Pay Off? 100
Effect of High Temperatures and Pressures on Cement 103
Engineering Reference Section 107-113
Pipeline Patrol: Eight Money-Saving Ideas 122

EXPLORATION . . .

Mississippi Gets Its Discovery 137
Rose Hill Field . . . Unique Oil Occurrence? 138

NEWS FEATURES . . .

They Say 39
Calender of Events 44
Journally Speaking 49
Editorial 51
This Week 53
International News 75
Refining News 115
Personals 151
Deaths in the Industry 153
Statistical Summary 154
Drilling Statistics 155
Supply Statistics 156
Refining Statistics 157
Demand Statistics 158

DEPARTMENTS . . .

Books 97
Equipment Design and Operation 107
Field Processing 109
Progress in Metals 111
Modern Drilling 113
Pipeline Patrol 122
Equipment Men in News 127
Equipment Digest 131
Trade Literature 135
Classified Advertising 159
Advertisers' Index 163

FIELDS . . .

Drilling Contractors 119
Area Field Reports 139

In Brief . . .

1. THREE-PROCESS PLANT . . . Deere & Co.'s new Pryor, Okla., ammonia plant will employ three processes: (1) partial oxidation of natural gas with oxygen; (2) Casale process for ammonia synthesis, and (3) Pechiney process to make urea. Plant features high degree of process integration, compact layout, reduced equipment size, and extensive use of automatic control.

2. AUTOMATIC FLOOD . . . Highly flexible and almost complete automatic operation is being achieved at the pilot water flood Shell Oil Co. recently launched in East Coalinga field of northern San Joaquin Valley, California. Electronic controls regulate the production, storage, transfer, filtration, and injection of the brackish water used in the experimental project.

3. NEW REFORMING PROCESS . . . First commercial Hyperforming unit will be put into operation this year at Signal Hill plant of Calstate Refining Co. Yield of 10-lb. R.v.p. gasoline will be 104.4 per cent by volume, with 9 per cent outside butane. Research octane rating with 3 ml. TEL per gallon is expected to be 93.7. Net cost of plant operation is less than 12 cents per barrel of product.

4. BASIN ROUNDUP . . . Of 51 new field wildcast drilled in the Warrior basin in little more than 2 years, 7 were completed as gas or gas-condensate wells, and 1 was completed as an oil well. Structure of the area is complex with many anticlines, some of which are faulted. Stratigraphic problems include lateral gradation of lithology and permeability of Chester sands, the difficulties of correlating the Chester section, and the difficulties of recognizing commercial sands.

5. DRILLING PLANS . . . British-American Oil Producing Co. uses a prognosis chart for planning the drilling of its deep wells. Each step and every item are studied and checked in advance. When final plans are approved, copies are transmitted to all employes concerned. Result is fixed field responsibility with definite and certain plans. Minimum time is lost in coping with unforeseen needs.

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Why tie up this capital when you can stock your drill pipe *only?*

THEN...

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RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Belt service tripled with B. F. Goodrich Grommet belts

Grommet V belts last longer; cost no more than ordinary belts

WHEN ordinary belts were used to run that oil pump, they wore out in six weeks or less—some lasted only 3 days! They couldn't take exposure to weather, oil, or stand the weight of the 160-pound floating pulley (see arrow). The well is a "sander", so when the pump stops working, the whole pumping mechanism has to be pulled from the 3000-foot well, cleaned, and put back.

The oil company tested practically every make of V belt, but none solved the problem until they tried a set of B. F. Goodrich Grommet belts. Instead of giving just 3 days' or 6 weeks' service, the Grommet V belts were still on the job after *six months*, still going strong. B. F. Goodrich belts are now used almost exclusively on this oil lease. Here's why Grommet belts outlast and outperform other V belts:

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If you're getting short service from your belts, try a set of the longer-lasting Grommet belts, and see the difference. You'll find these BFG V belts at leading supply houses in the oil field, or at any one of these B. F. Goodrich warehouses: Beaumont, Dallas, Fort Worth, Hobbs, Houston, Odessa, Wichita Falls, Great Bend, Oklahoma City, Tulsa, Williston, Denver and Los Angeles. *The B. F. Goodrich Company, Dept. M-283, Akron 18, Ohio.*

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INDUSTRIAL PRODUCTS DIVISION

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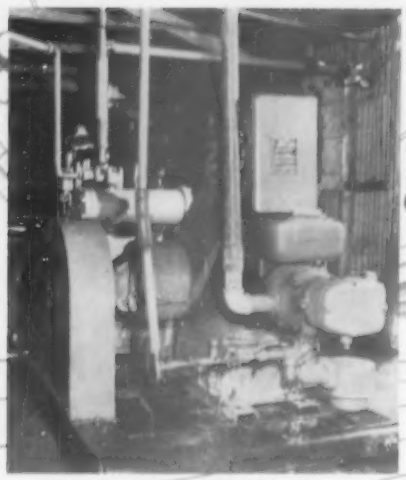

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And they do these things without breaking down when you need them most. Long life is built into these big yellow workhorses. The box sections on circle and drawbar, for instance, are the heaviest and strongest ever used on any grader—weighing 35 pounds per foot.

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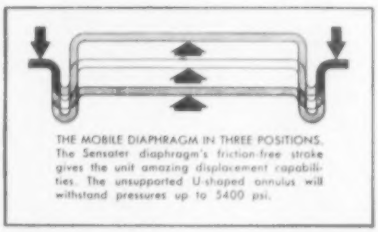
The Martin-Decker E-80 SENSATER

with the *MOBILE DIAPHRAGM*

Although the Sensater is a diaphragm-type pressure transformer, it slips in place on the anchor in the same manner as the piston type. Deadline pull on the anchor immediately transmits an accurate signal to the driller's weight-indicator dial.



THE MOBILE DIAPHRAGM IN THREE POSITIONS. The Sensater diaphragm's friction-free stroke gives the unit amazing displacement capabilities. The unsupported U-shaped annulus will withstand pressures up to 5400 psi.

Years of engineering research and on-the-rig testing have culminated in the E-80 *Sensater*, a revolutionary diaphragm-type sensing element for all types of hydraulically operated scales and other weight-indicating devices. Among the first instruments to be geared for Sensater operation were the famous Martin-Decker Type D and E Weight Indicators. The sensitivity of these weight indicators, long recognized as the leaders in oil-drilling instrumentation, has now been infinitely increased. The E-80 Sensater derives its accuracy and sensitivity from a new, wonder-working, mobile diaphragm that, through a novel construction principle develops a stroke equal to a piston's travel. *But*—although it displaces the same amount of fluid as the Type D or E piston—it does so with *no friction whatsoever!*

The Sensater's mobile diaphragm is far different from the diaphragms that most people are familiar with. Unlike ordinary diaphragms, it doesn't deflect, but always moves *with* its backing plate. Consequently, the area pushing against the hydraulic fluid remains constant, always transmitting a true indication. This absence of sag in the diaphragm also precludes any chance of its being ruptured by too much pressure. The diaphragm has a ½" U-shaped annulus which is held in place by the Sensater housing. When the diaphragm makes a stroke the unsupported part of this flexible, U-shaped outer-edge moves with a gentle, rolling motion that is free from stretch and friction.

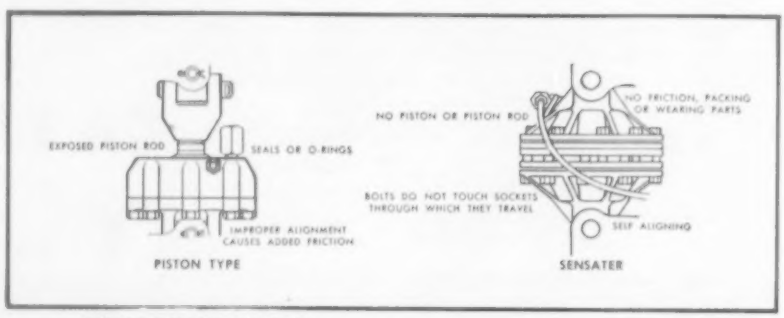
The Sensater opens new vistas of accurate measurement for crane weight indicators, hook scales, drawbar tension indicators, and many other types of hydraulic weighing devices. It transmits direct, no-lag signals to the weight indicator gauge, and does so without O-ring or other friction-causing packing. Nothing to wear out. It is completely self-aligning. Leakproof. It withstands tremendous pressure (up to 5400 pounds per square inch!). Positively unaffected by fluid and temperature changes. The accuracy of the weight indicator reading remains constant even if there is a variation in the amount of fluid in the system. Thus, there are no tricky installations, loading, or calibration problems.

The new E-80 Sensater will be furnished with all Type D and E Weight Indicator Wire Line Anchor combinations. If you choose to purchase a Sensater alone to replace your old piston transformer, the new equipment can easily be slipped into your anchor in a matter of minutes. Its self-alignment principle further simplifies installation and operation.

The engineering miracle of the Sensater is the *friction-free stroke*. There are no problems of friction, wear, or piston-rod corrosion, as are sometimes encountered with cylinder-type pressure transformers. Although the mobile diaphragm develops a stroke equal to a piston's travel, it is so engineered that one component cannot possibly rub against another. In fact, the mobile diaphragm is so free from friction that hysteresis (molecular resistance) can be measured only with delicate laboratory instruments.

The E-80 Sensater is rugged and foolproof. It is designed for years of trouble-free operation and to give you weight indicator accuracy never before thought possible.

Further information about the Sensater can be had by writing to the Martin-Decker Corporation, 3431 Cherry Avenue, Long Beach 7, California.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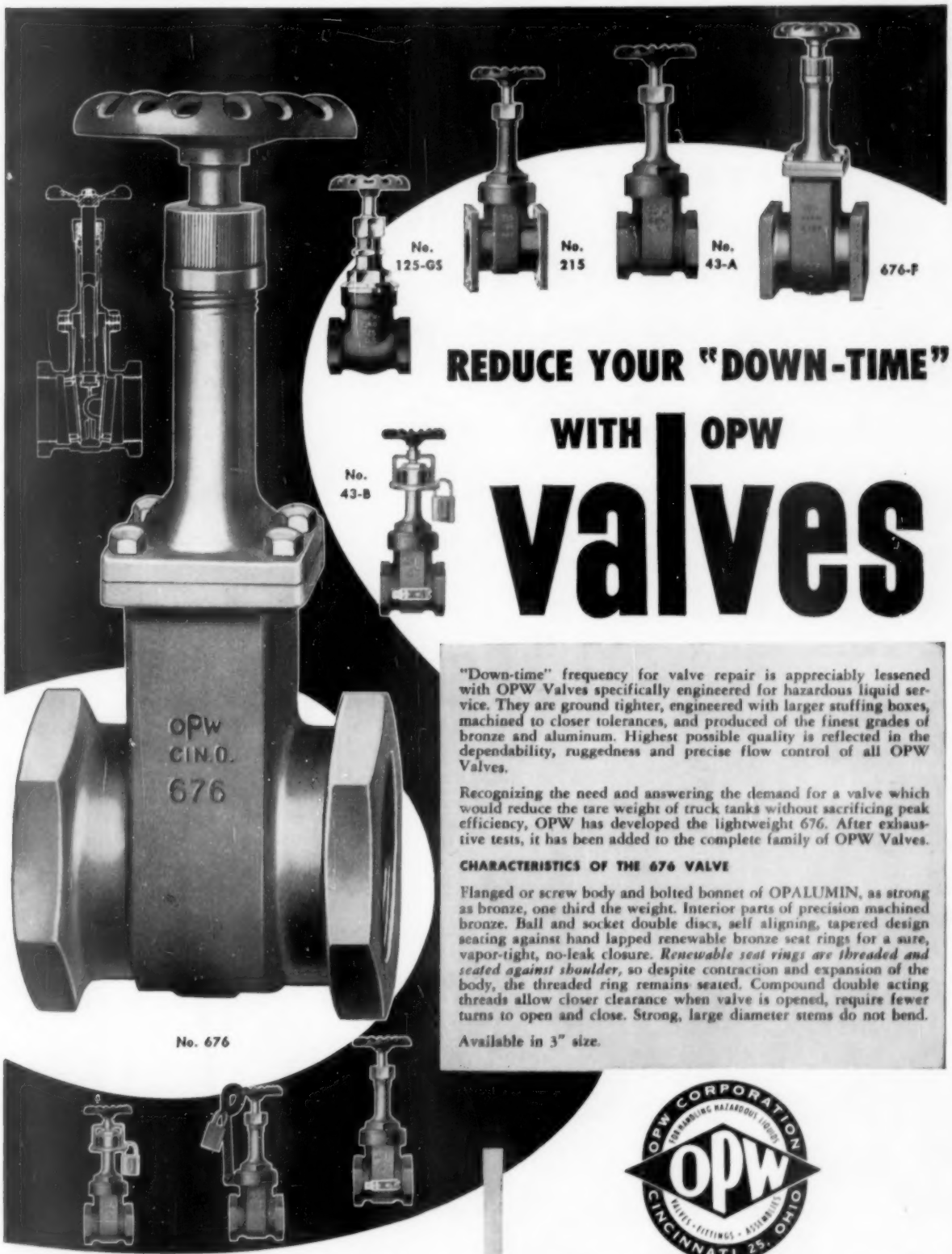

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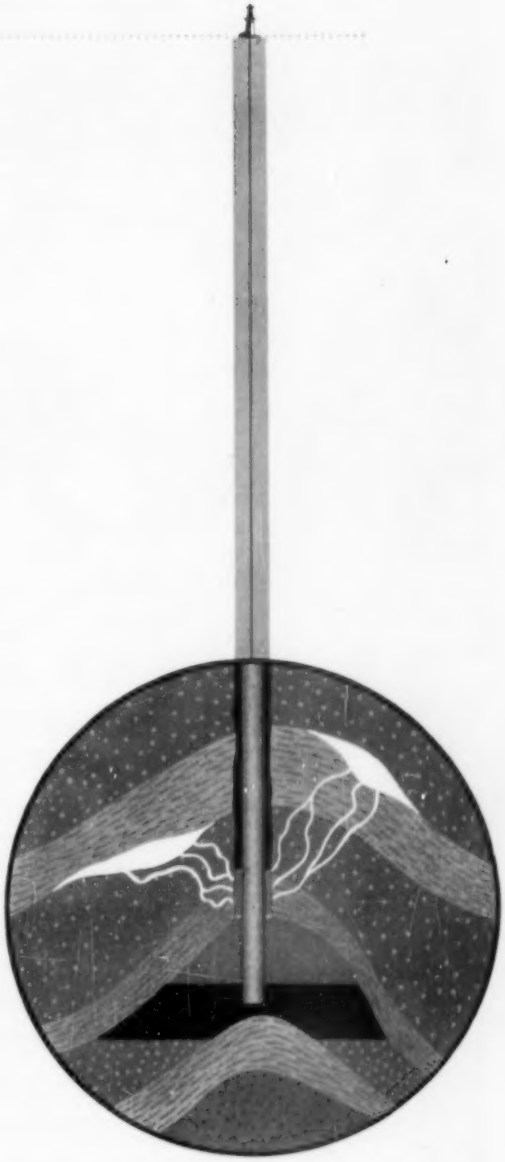

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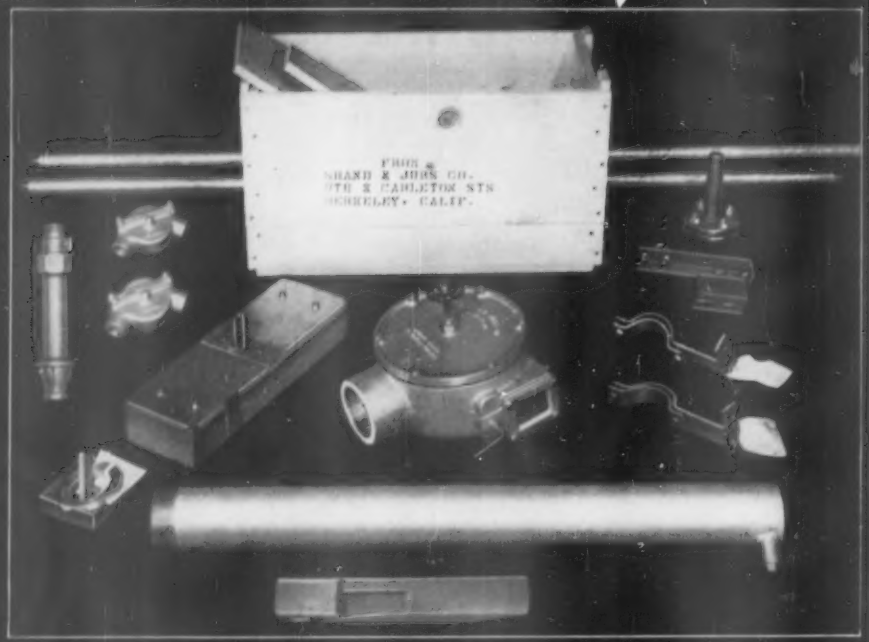

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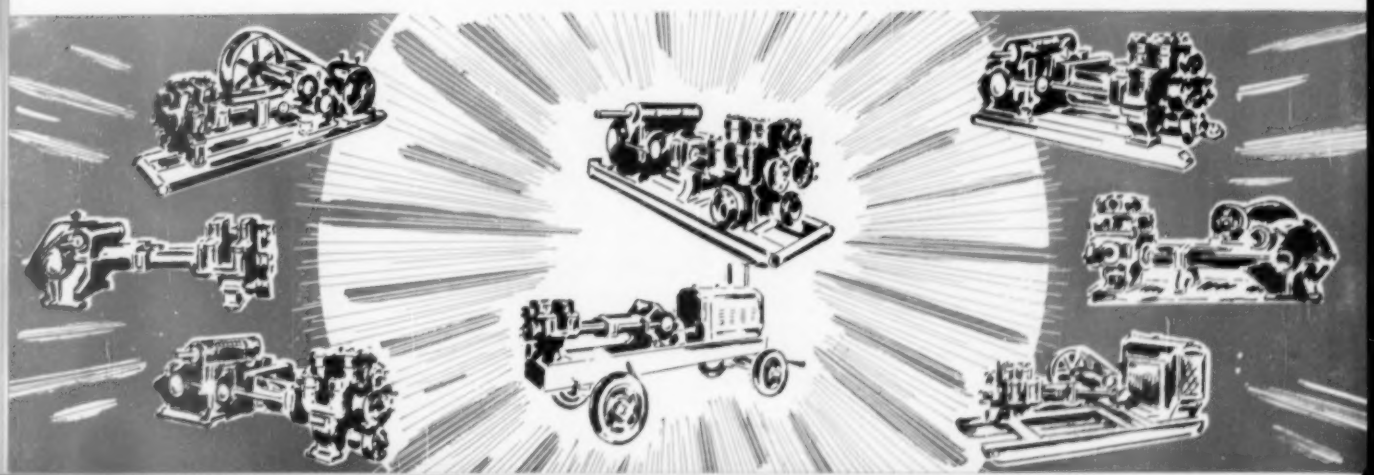

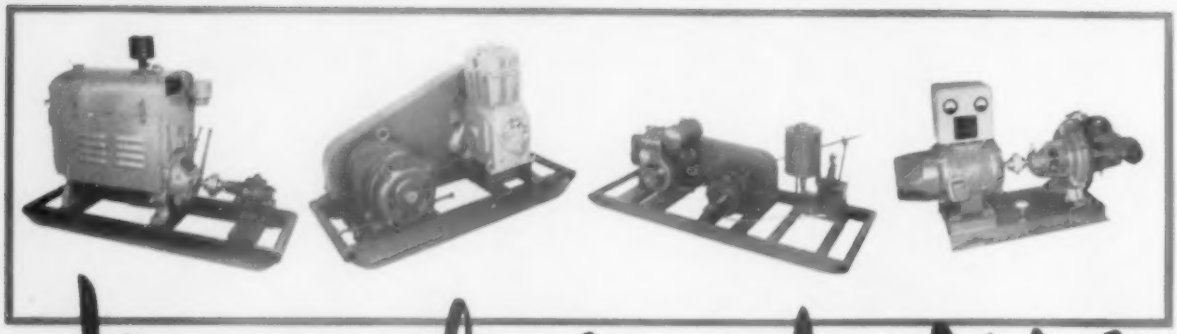

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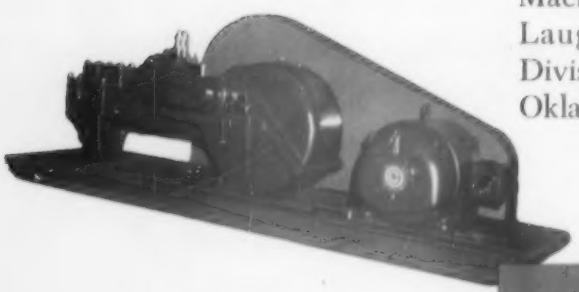

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Waukesha
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Buda
Wisconsin
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Hercules
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Worthington; Rotary, Centrifugal, Piston.
Gardner-Denver; Centrifugal and Piston.
Wheatley; Piston.
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Serving The United States and Canada

THESE 72 FIRMS

have bought one or more FLUOR FIN-FAN AIR-COOLED HEAT EXCHANGER within the past 13 years

The firms listed on this page, and many others, have bought Fluor Fin-Fans since they were first introduced in 1941. Customer acceptance is indicated by the number of repeat orders — over 50% of these firms have repurchased Fluor Fin-Fans, and several of them have used no other heat transfer equipment. Investigate Fluor Fin-Fans for dependable waterless cooling, and join this list of satisfied users.

Write for your copy of the FLUOR FIN-FAN *Bulletin* FF-FD-0.002

* A. T. & S. F. RAILWAY
* ALUMINUM COMPANY OF AMERICA
* AMARILLO OIL COMPANY
ATLANTIC REFINING COMPANY
BARNHART HYDROCARBON CORP.
* BLAW-KNOX COMPANY
* BOROUGH OF ASPINWALL
BOROUGH OF GROVE CITY
BROOKLYN UNION GAS COMPANY
CHICAGO CORPORATION
* CITIES SERVICE OIL COMPANY
* CITIES SERVICE GAS COMPANY
COLOMBIAN PETROLEUM CO.
* COLORADO INTERSTATE GAS CO.
* COOPER-BESSEMER
COPRA OIL & MEAL COMPANY
* COSDEN PETROLEUM COMPANY
DRESSER ENGINEERING CO.
* EL PASO NATURAL GAS COMPANY
* EQUITABLE GAS COMPANY
GIRDLER COMPANY, THE
HOME GAS COMPANY
HONOLULU OIL CORPORATION
* HOPE NATURAL GAS COMPANY
* LOMITA GASOLINE COMPANY
* LONE STAR PRODUCING COMPANY
* MICHIGAN-WISCONSIN PIPE LINE CO.
MONTANA-DAKOTA UTILITIES
OHIO OIL COMPANY, THE
* OTHA H. GRIMES
PACIFIC NUT OIL COMPANY
* PEOPLE'S NATURAL GAS COMPANY
* PERMIAN BASIN PIPE LINE CO.
PHILADELPHIA ELECTRIC COMPANY
* PHILLIPS PETROLEUM COMPANY
PIONEER NATURAL GAS COMPANY
* RICHFIELD OIL CORPORATION
RUNNELS GAS PRODUCTS CORP.
SAN DIEGO GAS & ELECTRIC CO.
SAN JOAQUIN COTTON OIL CO.
* SHELL OIL COMPANY
SID RICHARDSON GASOLINE CO.
* SINCLAIR OIL & GAS COMPANY
SOHIO PETROLEUM
* SOUTHEASTERN PIPE LINE COMPANY
* SOUTHERN CALIFORNIA GAS CO.
* SOUTHERN COUNTIES GAS CO. OF CALIF.
* STANOLIND OIL & GAS COMPANY
STANDARD OIL COMPANY OF CALIFORNIA
* STANDARD-VACUUM OIL COMPANY
STAUFFER CHEMICAL COMPANY
* SUNRAY OIL CORP.
SYLVANIA CORPORATION, THE
* TENNESSEE GAS TRANSMISSION CO.
* TAYLOR OIL & GAS COMPANY
TEXAS COMPANY, THE
* TEXAS EASTERN TRANSMISSION CORP.
* TEXAS GAS TRANSMISSION CORP.
* TEXAS-ILLINOIS NATURAL GAS PIPE LINE
TIDE WATER ASSOCIATED OIL CO.
* TRANSCONTINENTAL GAS PIPE LINE CO.
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WESTINGHOUSE ELECTRIC
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**Repeat customers who have bought more than one Fin-Fan.*

BE SURE WITH **FLUOR**

THE FLUOR CORPORATION, LTD
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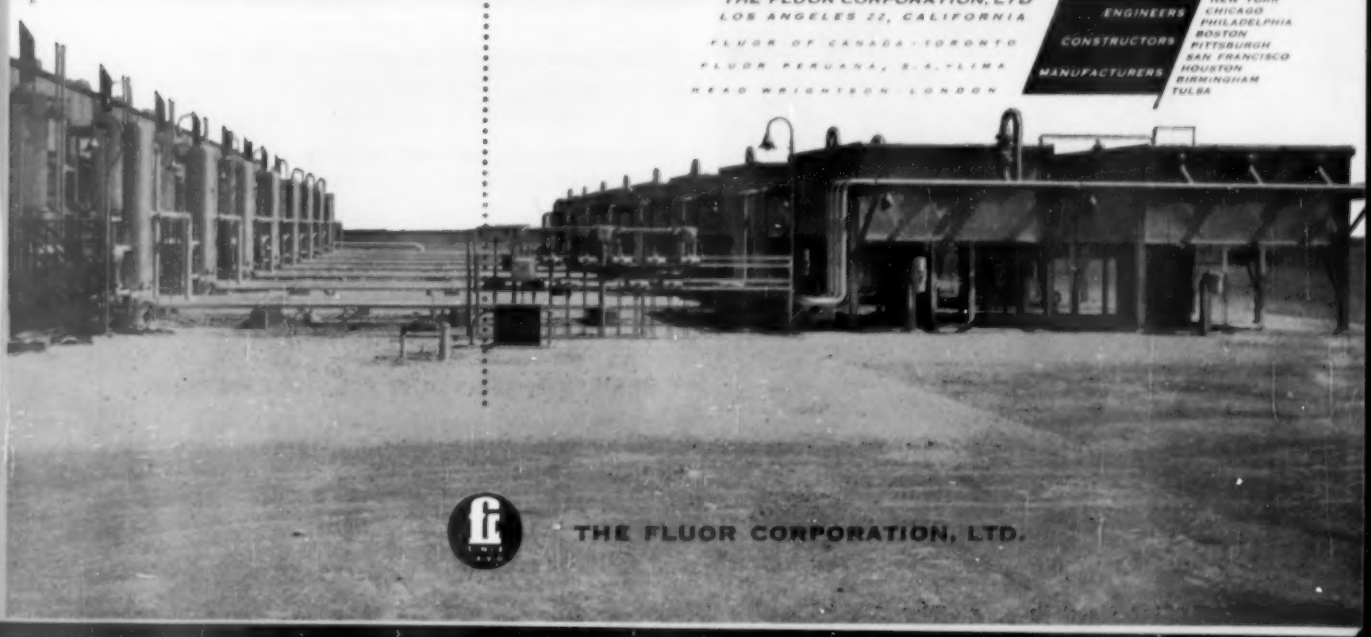


THE FLUOR CORPORATION, LTD.

the quality leak-resistant tubing

SPANGSEAL TUBING

SPANGSEAL TUBING PROVIDES:

- **FASTER MAKE-UP** since integral joint has only 2 threaded elements
- **MAXIMUM LEAKAGE RESISTANCE** through metal-to-metal conical sealing surfaces
- **MORE HOLE CLEARANCE** by reduced maximum O.D. of joint
- **ELIMINATION OF "HANGING-UP"** through use of streamlined contour on female end

National Supply's constant research and development in oil country tubular goods has made possible Spang Tubing that withstands the high pressures inherent in today's deepest wells . . . and also reduces costly remedial jobs through exceptionally leak-resistant Spang tubing joints.

This exceptional quality of Spangseal and Spang Extreme Line Tubing in handling unusual well operating conditions

CORROSION RESISTANT PLASTIC COATING FOR SPANG TUBING AND DRILL PIPE

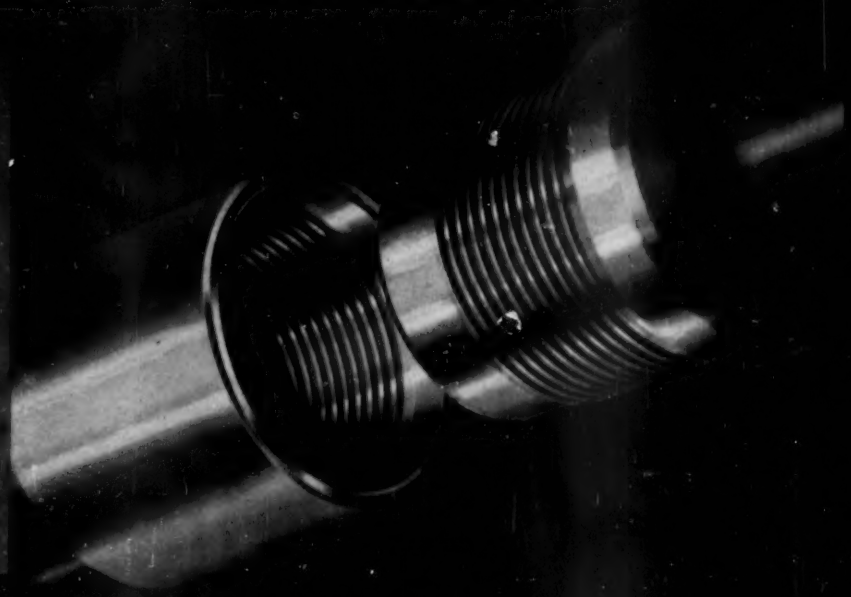
To increase corrosion resistance, a phenolic plastic coating can be applied at the mill on all Spang Tubing and Drill Pipe. Ask the National Supply Representative about this Spang service.

for every well condition

SPANG EXTREME LINE TUBING

SPANG EXTREME LINE TUBING PROVIDES:

- **MAXIMUM RUNNING SPEED; JOINT MAKE-UP** with integral joint featuring wide threads
- **100% JOINT STRENGTH** in all weights
- **STREAMLINED** interior and exterior contours
- **MAXIMUM LEAKAGE-RESISTANCE** with metal-to-metal conical seal
- **50% LESS CONNECTIONS** with integral joint design
- **POSITIVE SHOULDER CONTACT ENGAGEMENT** for proper make-up and tightness of joint



is verified not only by Spang's continuous "extreme condition" plant tests . . . but by customers' performance reports, as well.

Compare the outstanding features of both Spangseal and Spang Extreme Line Tubing shown above . . . with your own experiences in tubing costs, running time and service life . . . and you can readily see how Spang quality features and advantages mean definitely lower operating costs.

You can get complete information on the Spang family of tubular products, which includes Spangweld Drill Pipe, Spang Double Seal Shrink Thread Drill Pipe and Spang Extreme Line Casing, from the local National Supply Representative or Store. Ask today for the latest bulletins on these top quality products.

First in quality . . First in supply service . . in oil country everywhere

Spang-Chalfant Division

THE NATIONAL SUPPLY COMPANY

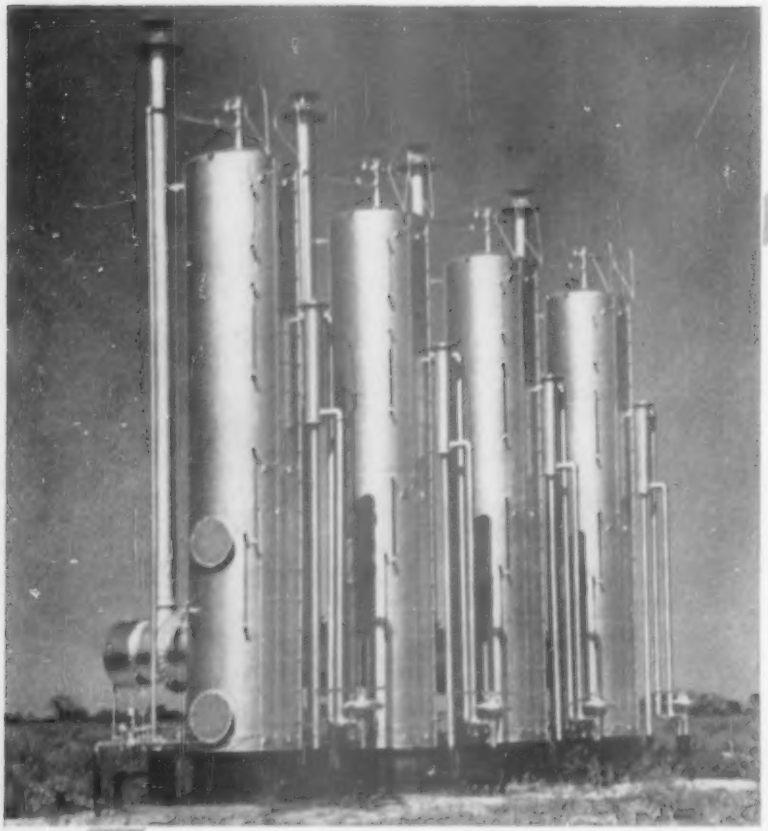
PITTSBURGH 30, PENNSYLVANIA

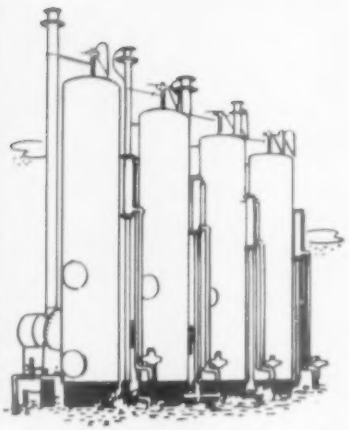
DIVISION TUBULAR OFFICES: Denver, Colorado; Houston, Texas; Fort Worth, Texas; Los Angeles, California; Pittsburgh, Pennsylvania; Tulsa, Oklahoma; Calgary, Alberta, Canada

NATIONAL BLUE PRODUCTS

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

Parkersburg Emulsion Treaters...





are the solution to your Treating Problems

Selecting the right treater for maximum efficiency means coordinating a multitude of emulsion conditions with treater operating characteristics.

Only in Parkersburg's extensive line of Emulsion Treaters can you find the treater that meets these vital requirements exactly, and without compromise.

Regardless of type of emulsion, climate, capacity or other conditions, you'll get more performance and service for your money from a Parkersburg Treater.

The multitude of design advantages incorporated in every type—the engineering of special factors to meet specific installations are further proof that you get more for your money with Parkersburg Emulsion Treaters.

5423

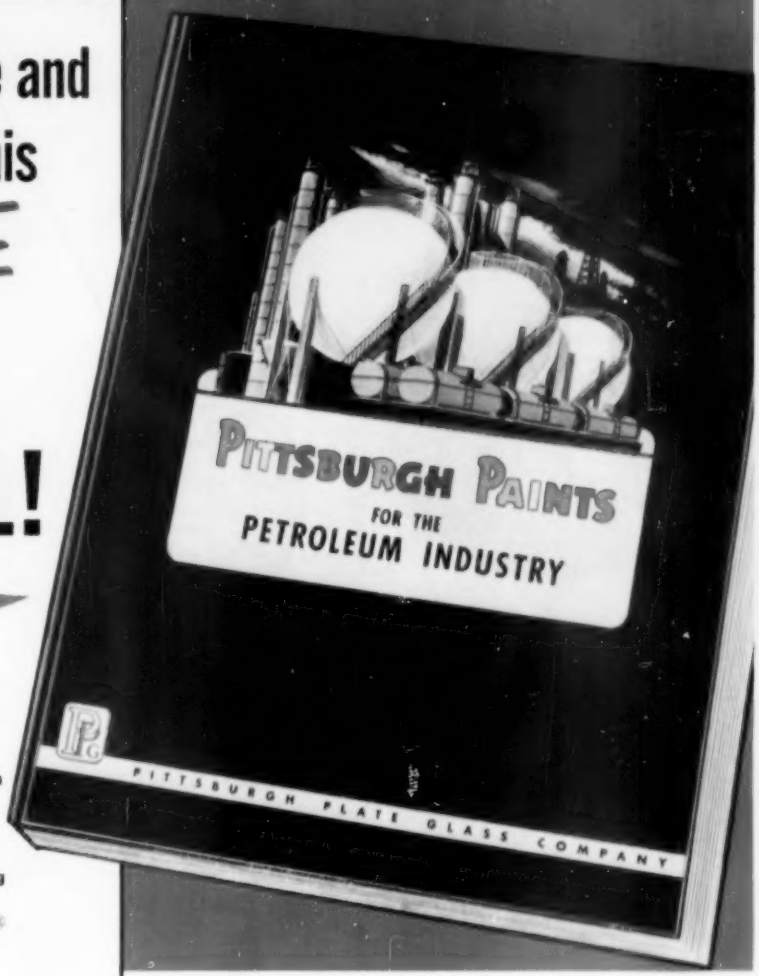
THE PARKERSBURG RIG & REEL COMPANY • PARKERSBURG, WEST VIRGINIA

Division of Parkersburg-Aetna Corporation

PRESSURE EQUIPMENT

SEPARATORS • HYRECO • DEHYDRATORS • KNOCKOUTS • SCRUBBERS • TREATERS • HEATERS

You'll Save Time and Money with this FREE PAINT MANUAL!



Contents Include:

1. Product description.
2. Application recommendations.
3. Large-size color chips.
4. Inspection, surface preparation and painting of storage tanks.
5. General maintenance and painting suggestions.
6. Recommendations for painting automotive equipment.
7. How to use COLOR DYNAMICS® painting system.

IF you buy or use paints, here's a highly practical manual that places vital information about refinery finishes of all kinds always at your finger tips.

This handy desk-size volume contains complete descriptions of all Pittsburgh Paints for the petroleum field. These finishes are the finest it is possible to make. Their formulations are the result of the latest and best knowledge developed by Pittsburgh's large and skilled technical staff.

Also included in this book are numerous suggestions for proper application and maintenance. Many of these have been derived from Pittsburgh's long experience in supplying leading petroleum producers with high-quality finishes that have proved to be unusually successful in beautifying and preserving many types of surfaces.

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No Matter How You Look at it . . .

GREEN TRIANGLE Rotary Hose *Is Best!*

STRENGTH
For today's high drilling pressures.

FLEXIBILITY
The correct hose for all types of derricks.

DURABILITY
Maximum footage at minimum cost per foot drilled.

THERE'S a Green Triangle Rotary Hose for every possible drilling pressure . . . for all types of derricks.

THERE'S a Continental and New York Belting & Packing Co. Specialist in rotary hose application to help you in the correct selection for your rig.

▲ **1-Band:** 3000 lb. test pressure on delivery. Ideal for small rig use at medium or low pressure. API Class A. *Carries* API *Label*

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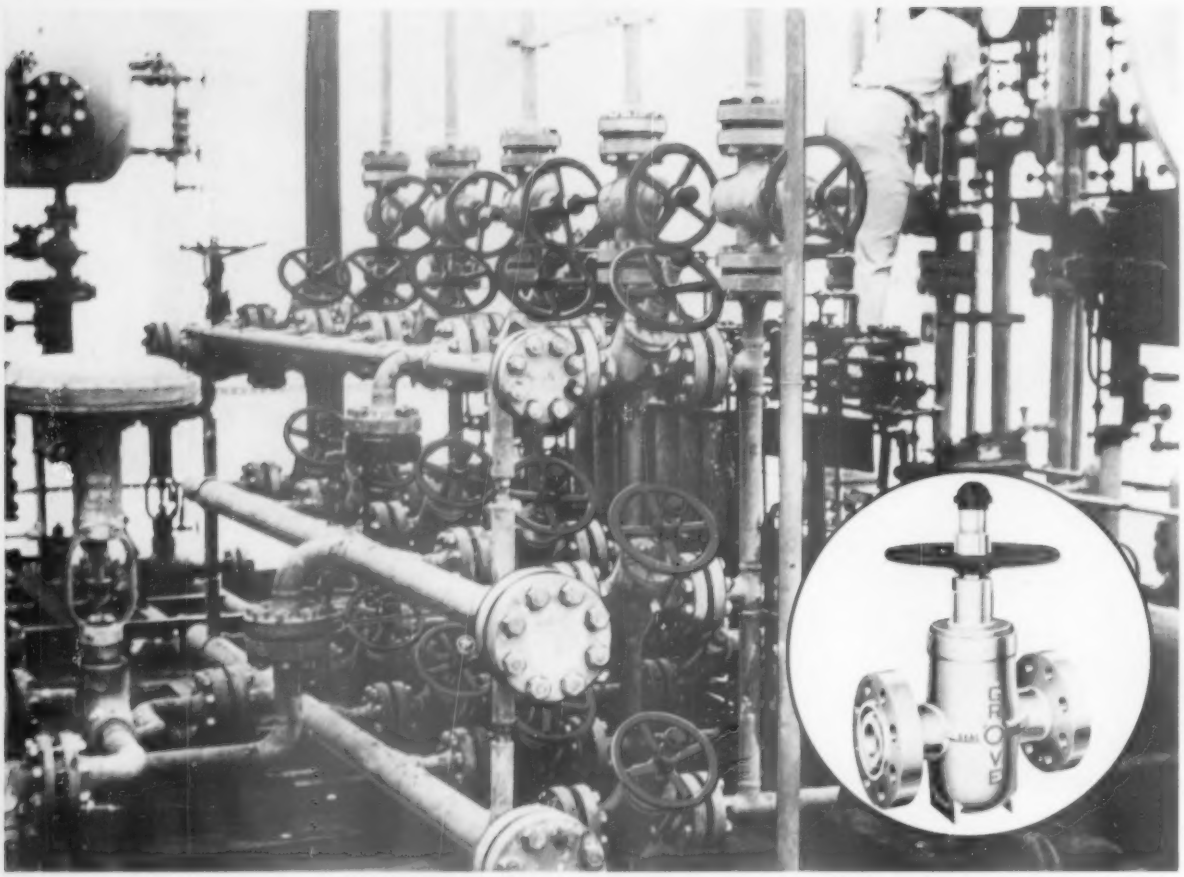
NEW WORK BELTING & PACKING CO
Founded 1846

CONTINENTAL
Serving the Oil and Gas Industries



Grove Seal-"O"-Ring Gate Valves replace other valves at Red Fish Bay installation

The photograph above shows a portion of one of three flow manifold platforms at Red Fish Bay. This one was originally equipped with Grove Seal-"O"-Ring Gate Valves, which performed without leak or maintenance even from the very first, when subjected to the mud and sand carried up by the initial flow of gas.

Competitive valves on the other two platforms soon failed under similar operating conditions. As their replacement rapidly became necessary, Grove Seal-"O"-Ring Gate Valves were installed because of the performance record established on the first platform.

Now, after over a year, every one of the Grove Seal-"O"-Ring Valves on all three platforms is operating freely with dead-tight seal. There has been no maintenance—no parts replacement—and no greasing on any of the Grove Valves since they were installed! This is but one of many installations that have proved Grove Seal-"O"-Ring Valve superiority.

Available through leading oil field supply stores

405

GROVE SEAL-"O"-RING Gate Valves

GROVE SIMPLICITY ACCURACY SAFETY

GROVE REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California

HOUSTON 4—1901 Calumet St. • **LOS ANGELES 6**—1930 W. Olympic Blvd. • **NEW YORK 17**—415 Lexington Ave.

CORPUS CHRISTI, TEXAS	ODESSA, TEXAS	TULSA, OKLAHOMA	LAFAYETTE, LA.	NEW ORLEANS, LA.	DENVER, COLO.
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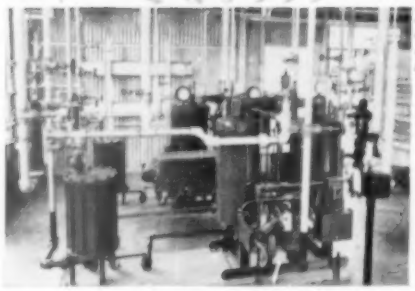
"Whenever We Install Instruments, We Prefer To Install Air Driers... *regardless of outside humidity!*"



This fully automatic Lectrodryer DRYs instrument air prior to its being fed to the many pneumatically operated instruments at the Stanolind Oil & Gas Company's Stano Gasoline Plant, Ulysses, Kansas, pictured above.

"There's no cause to worry if you DRY instrument air. It assures trouble-free operation." These statements were made by the Stearns-Roger Company of Denver, the firm that engineered the Stanolind Oil & Gas Company plants of the type pictured.

To prevent cold weather air line freeze-up... to halt rust, scale and sludge in air lines, you must get rid of moisture. You can do this by installing a Lectrodryer*. These machines work continuously, automatically and economically, extracting vaporous moistures from instrument air... reducing the dewpoint in air lines to as low as −100° F.

Install a Lectrodryer in your instrument air lines. It's the safest and most economical way to keep harmful moisture from your instruments.

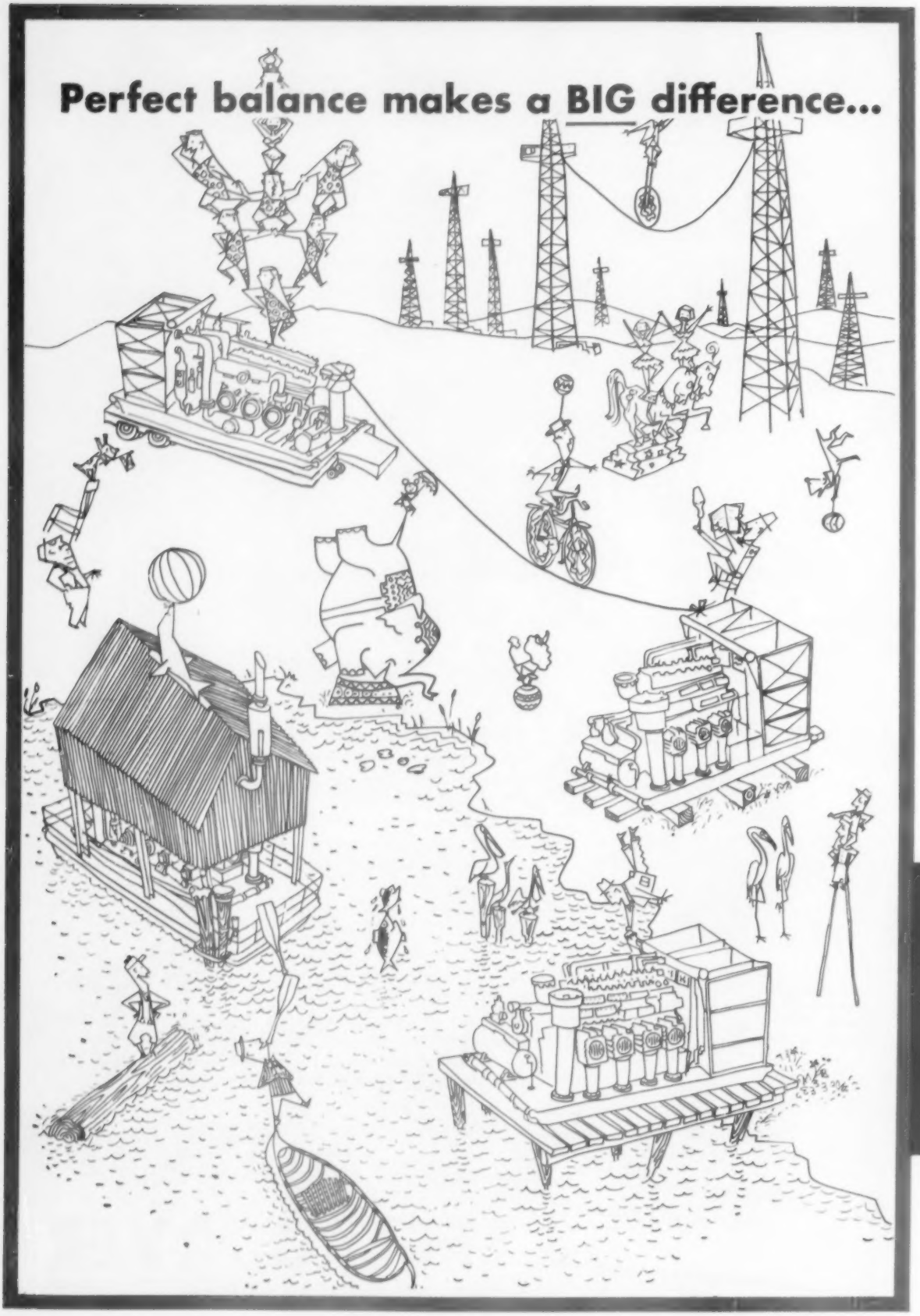
Write for *Because Moisture Isn't Pink*, a booklet describing what Lectrodryers are, how they work and how they are being used in industry. Pittsburgh Lectrodryer Corporation, 325 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY
WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U. S. PAT. OFF.


Perfect balance makes a BIG difference...

Clark "Midget Angles"

can be operated ANYWHERE

on trailers, timbers, piles, barges

There's no problem about *where* or *how* to install a Clark Midget Angle. Because it has perfect balance — virtually *vibrationless operation* — it can be put to work anywhere. No large, expensive foundations are needed.

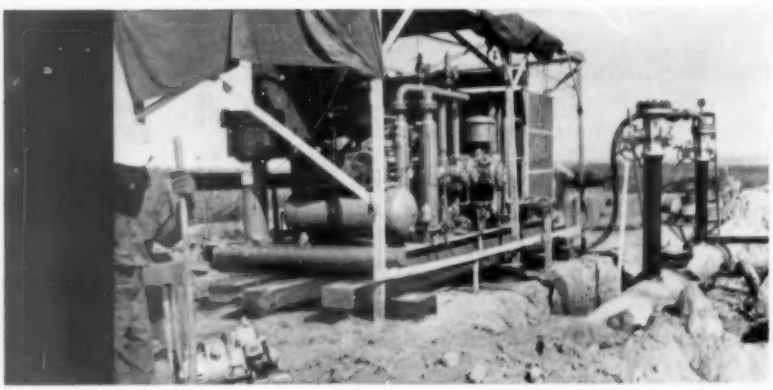
On timbers, piles, barges, trailers, swampland, steel framework . . . *you* name it . . . a Midget Angle is ready to go to work wherever you need it. Obviously, less installation cost is involved and less time is required to get the unit on stream.

Perfect balance is an exclusive Clark HMA feature achieved through a patented design principle. It is one of many important features that single out the Midget Angle as the only true field compressor built today. Over 650 installations prove its superiority.

If you have field gas to move, and you need compressors in the 85 to 440 bhp range, it will be to your advantage to contact the nearest Clark representative and write for Bulletin 126.

CLARK BROS. CO. • **OLEAN, N. Y.**
DIVISION OF DRESSER OPERATIONS, INC.
Sales Offices in Principal Cities throughout the World

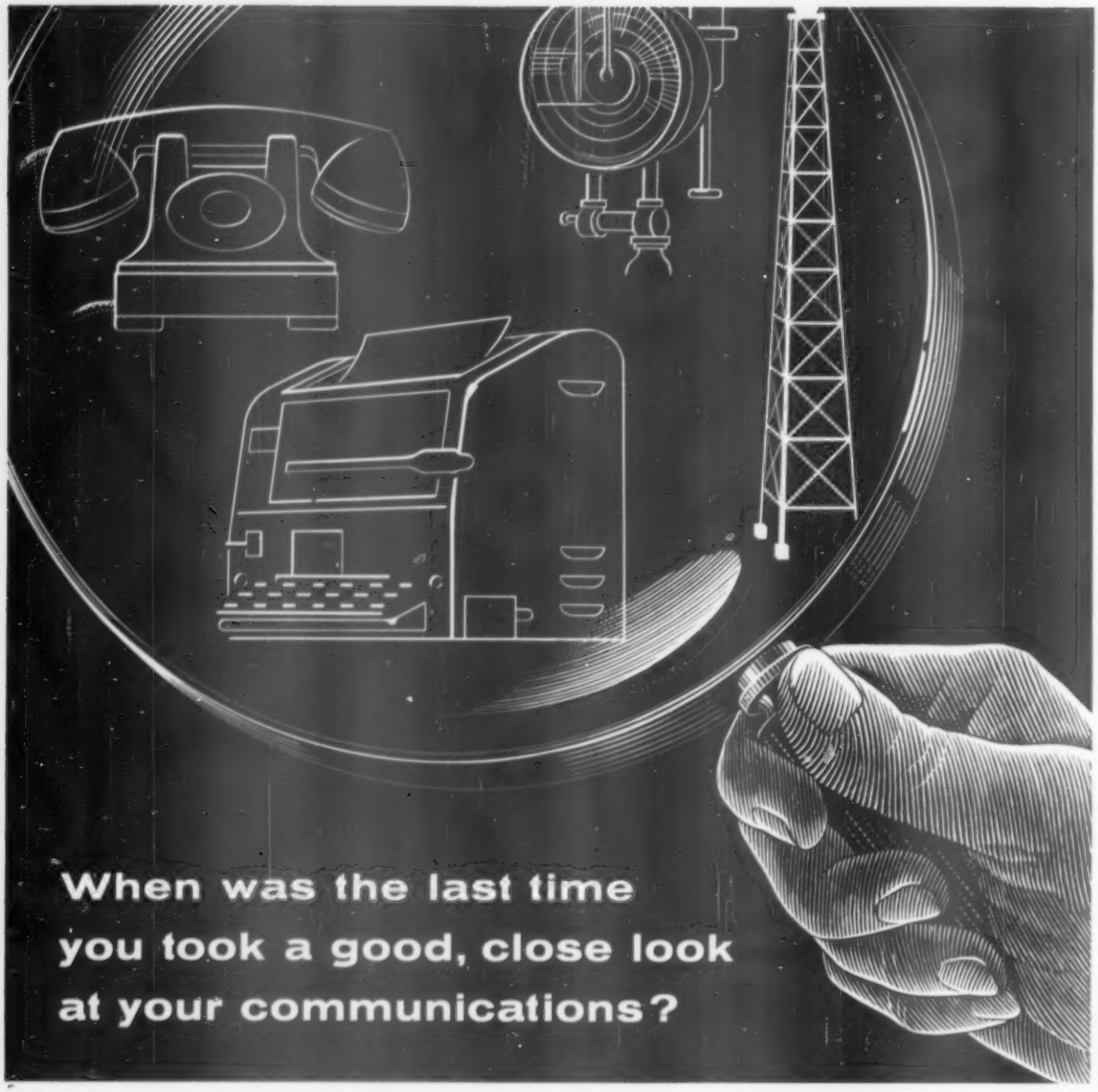
Compact, factory packaged



CLARK®

compressors

Clark sets the pace in compressor progress



To keep in step with your constantly changing business, your communication system should be examined periodically. In that way, your communications never become outdated — always meet your exact needs at the lowest cost. If you have Bell System service, such studies are a continuing activity.

Bell System communication engineers will also help you take a good, close look at your own communications . . . *at no cost to you!* Their detailed study will help you get the most efficient use of your facilities . . . whether they are long distance, mobile, teletypewriter, or metering and supervisory control.

A growing number of pipelines are taking advantage of Bell System service in meeting the communications demands of modern operation.

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If you are interested in a detailed communication survey by Bell System engineers without charge, call your local Bell Telephone representative now.

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TELETYPEWRITER

MOBILE TELEPHONE

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BELL TELEPHONE SYSTEM

SERVICE...

plus EQUIPMENT you can depend on

Check this list of our suppliers. All of them are big names in the oil industry. We have bought from many of them for 25 years or more because *we are sure of their quality products and have confidence in their generous guarantees.*

For SERVICE plus EQUIPMENT you can depend on, see IVERSON SUPPLY for all your Drilling, Production and Refinery Equipment.

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FALCONROD

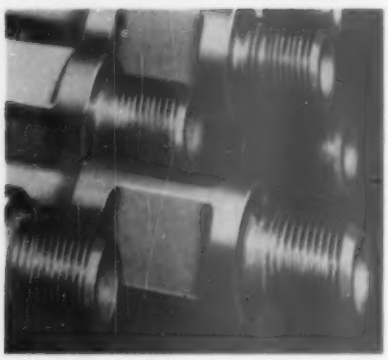
HOLLOW SUCKER RODS

Falconrod hollow sucker rods have proven their value in the field, making large savings possible by eliminating shut-downs and stripping of problem wells — and by permitting introduction of treating compounds into flowing wells.

Save well stripping costs

Falconrods provide the most economical means ever developed for treating wells having high paraffin content, asphaltic deposits, corrosion, emulsion and low-gravity, high pour-point crude oils. By injecting hot oil, steam, chemical solvents, corrosion inhibitors or volatile treating compounds through the hollow passage in Falconrods into the well, problems are often solved with *savings of $250 and over, without loss of production.*

Falconrods have also been used with great success in flowing wells to introduce heat to the producing formation and to provide circulation to free stuck pumps, packers and liners. Wax, asphalt and other elements are kept in solution, resulting in cleaner flow lines, cleaner traps and gathering lines, lighter well torques and lower maintenance costs.



Falconrods are made to API specifications of field-tested materials. All welds are 100% inspected, magnafluxed and normalized to prevent any chance of failure. Pin threads are cut to make Falconrods interchangeable with all other API connections and are available in standard 25 and 30 foot lengths. Falconrod pony rods are supplied in 2 to 12 foot lengths. Falconrod polished rods are also available in 8 to 22 foot lengths. Standard bored couplings are available.

For complete details about Falconrods, send for our new Bulletin.

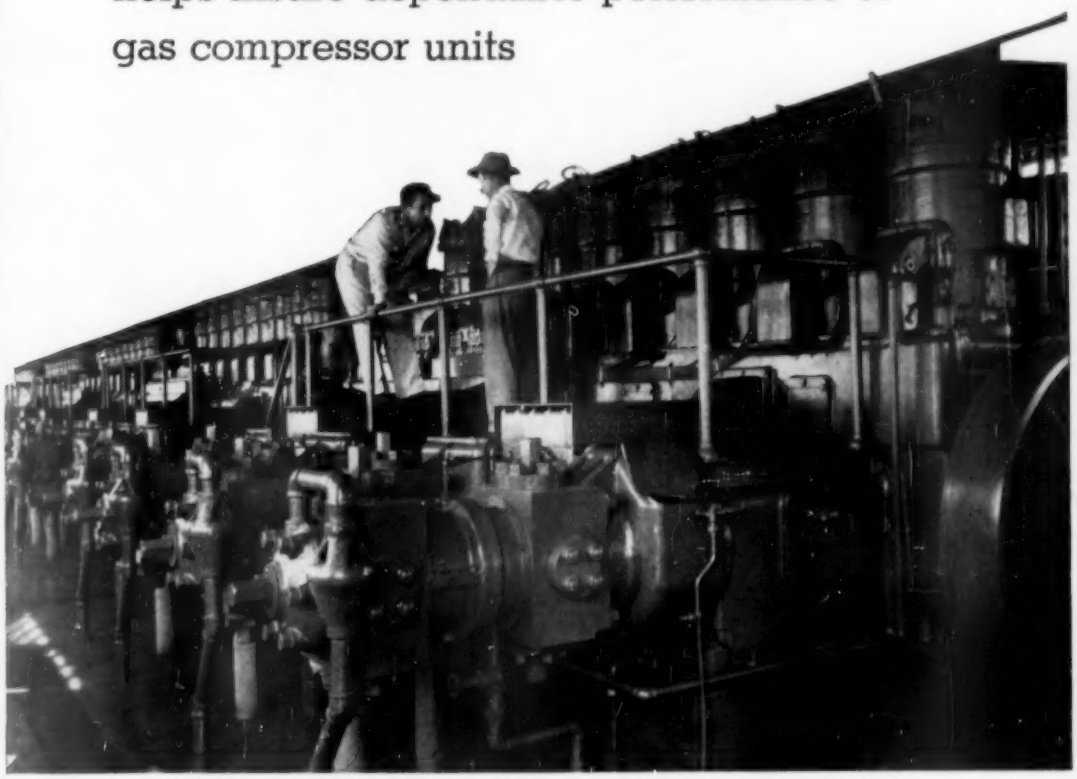
FALCON PRODUCTS, INC.
949 EAST SECOND STREET • POMONA, CALIFORNIA

FALCON PRODUCTS OVER THE WORLD

available through leading supply houses everywhere

GULF SECURITY OIL

helps insure dependable performance of gas compressor units



Smooth, continuous operation is a must for these units in service at a South Texas gas compressor plant. They are responsible for the steady flow of essential natural gas through pipe lines to homes and industries as far north as Detroit and New York. Gulf Security Oil provides the sure, effective protection needed for cylinders and bearings in both engines and compressors.

You can depend on Gulf Security Oil to provide the proper lubrication that is so important to vital compressor units if operating troubles are to be prevented and maintenance costs kept low.

Gulf Security Oil has a record of outstanding performance in scores of gas transmission plants. After years of operation with this quality oil, the cylinders and piston rings of both the compressors and power assemblies show negligible wear. And few carbon deposits have formed on power cylinder ports and pistons.

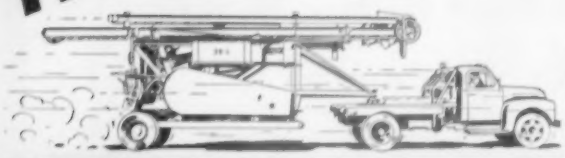
If you are installing new compressor units, or feel that you're not getting the most effective lubrication possible for your present units, it will certainly pay you to try Gulf Security Oil. Contact your nearest Gulf Office and have a Gulf Sales Engineer call.

Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PENNSYLVANIA

GULF INDUSTRIAL LUBRICATION

Here's Speed That Pays Off



in Lower Per-Foot Costs

One reason why there are more Bucyrus-Erie spudders in use today than any other make is that they do everything with the speed you need for profitable operation.

With mobile mountings — semi-trailer, skid, or tandem axle* — you waste no time in moving these rigs (all in one compact unit) from one location to another. You get the jump on every job!

Quick set-ups and knock-downs increase production, too, because you get more actual drilling time on each job as a result. All-steel telescoping derricks are power raised; folding tubular braces move easily into place; the entire set-up operation takes as little as two or three hours, even with the largest machine.

And you can't beat the speed with which Bucyrus-Eries put down hole. Snappy spudding action, with shock absorber that can be blocked out for deep drilling, means real drilling speed even in tough formations. Forward and reverse speeds on all reels provide accurate, split-second control. Reels are freewheeling for lowering.

Bucyrus-Erie spudders are sold by exclusive distributors in all principal oil fields. Four models: 48-L swings 6,000 lb. tools, drills to 6,000 ft.; 36-L handles 4,200 lb. tools, drills to 3,500 ft.; 28-L swings 3,000 lb. tools, drills to 2,500 ft.; 60-L tool rating 2,750 lb., depth 1,500 ft. See your distributor for full details.

9554C

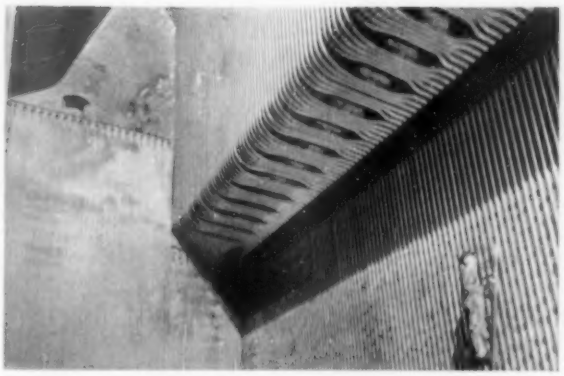
First With the Finest in Spudders

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin

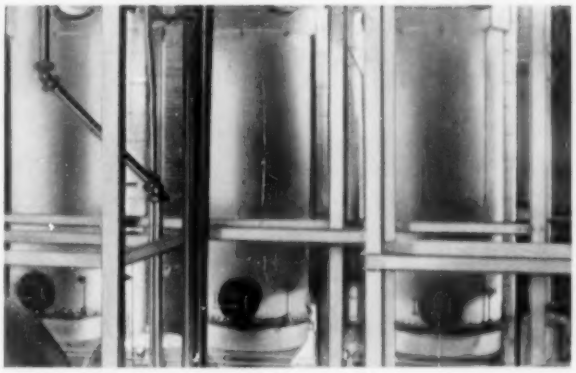
* Standard mounting for 48-L; optional at extra cost for 36-L. Not available for 28-L or 60-L.

There's no limit to what you can do with the right tubing!



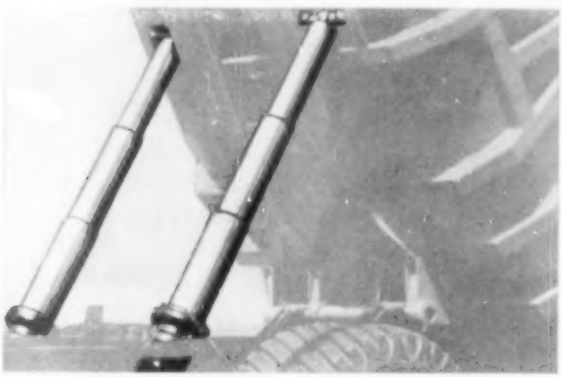
make power to light a city . . .

There are more than 12 miles of Globe seamless pressure tubing (carbon, alloy, and stainless) in this modern boiler which is a vital part of the electric power plant that serves a large metropolitan community.



transfer corrosive liquids . . .

Black liquor, used in production of kraft papers, is highly corrosive and has to be carried under pressure in multiple effect evaporators. Gloweld (electric welded) Stainless Steel Tubing was found to do the job best—at lowest cost.



or lift a load of dirt . . .

Mounted on a dump truck, these twin hydraulic hoists are built to handle heavy loads. Design and production is simplified by making the telescoping arms of Globe mechahical tubing.

THERE are probably a thousand and one different tube applications that could be made in your own products or industry. Check the possibilities. Globe engineers will be pleased to give helpful advice on how the right tubing — Globe tubing — can help you save time, save money, save manpower. Write for literature on any of these products.

GLOBE STEEL TUBES

GLOBE STEEL TUBES CO.
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Field Offices: Chicago • Cleveland • Detroit • New York
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A quick check list of GLOBE STEEL TUBES

ALLOY STEEL: to meet heat, corrosion, pressure, and structural strength problems. Carbon Moly, Chrome Moly Nickel and others. Sizes: O.D. from ½ to 6 inches. Wall thickness .035 to 1.000 inch.

CARBON STEEL: for load bearing structural members with strength, least weight . . . for fast, low-cost manufacturing of machine parts or pressure tubing applications. Low and medium carbon. Sizes: O.D. ½ to 7½ inches. Wall thickness: .028 to 1.000 inch.

STAINLESS SEAMLESS: in sizes from ½ inch to 6 inches O.D., and in pipe sizes ⅛ inch to 6 inches, standard, extra strong and double extra strong weights.

STAINLESS WELDED: Gloweld electric welded stainless steel tubing offers many economies. Sizes: O.D. ¼ to 5 inches. In standard wt. pipe sizes ⅛ to 2 inches. In lightweight pipe sizes ⅛ to 4½ inches inclusive.

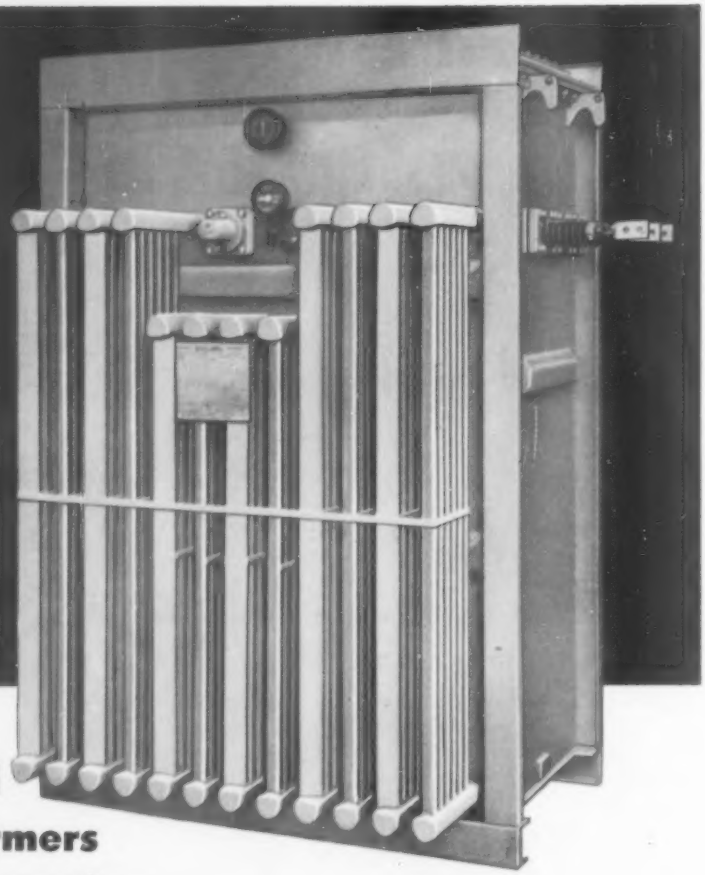
HIGH PURITY IRON: Globeiron tubing is 99.5% pure ingot iron. For applications where ductility, toughness, easy weldability and easy forming are desired or for use where magnetic permeability and electrical properties are required.

SPECIAL ANALYSES: Globe Steel Tubes Co. regularly produces tubing to special customer specifications. Consult with Globe's representatives for analyses to suit your needs.

GLOBE WELDING FITTINGS: seamless, carbon and stainless, available in a complete line of sizes and weights through Globe distributors in key cities.

Wagner®
TRANSFORMERS
...the choice of leaders in industry

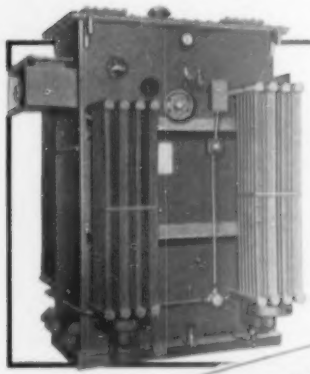
first step to building a compact, modern Unit Substation



THE NEW

Wagner Liquid-Filled Load Center Transformers designed for flush mounting

Now, Wagner Noflamol (non-inflammable liquid-filled) Load Center Transformers are available in a new, improved close-coupled design, as well as in the standard throat-connected design. These transformers can be flush-mounted with any make of switchgear to form a neat, compact, streamlined unit substation for modern industrial service.



Wagner
Throat-Connected Unit Substation Transformers

For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish these liquid-filled transformers in ratings to 2000 kva, 15 kv and below. Bulletin TU-13 gives full information.

Wagner close-coupled transformers are available in ratings from 500 through 2000 kva. They are carefully designed to meet your distribution requirements.

Look to Wagner for better transformers that assure a continuous, dependable flow of power. Your nearby Wagner engineer will be glad to help you solve your load-center problems. Call the nearest of our 32 branch offices, or write us.

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EST. 1891

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T54-11

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with SUPERIOR HEAT EXCHANGERS

Unlimited engineering facilities plus an adequate plant and equipment, make the sky the limit on Superior Combustion Industries' ability to design and fabricate heat exchangers for the most unusual conditions. Those shown here, designed for gas-to-gas heating, are 40 ft. high and 40" in diameter.

Our engineering staff invites your inquiry regarding any proposed installation . . . as a basis for a specific engineering recommendation.

For details of construction, write today for fully illustrated Catalog 6011.

for performance you can **BANK** *on*

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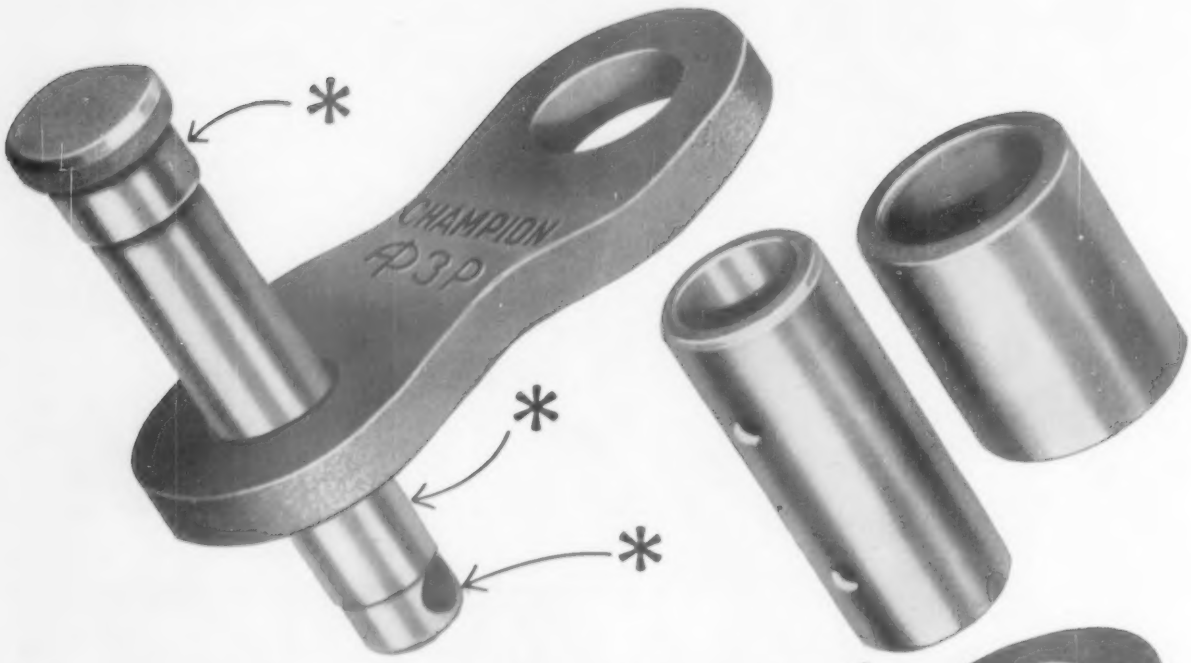
SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.



No special glasses needed for our 3D*

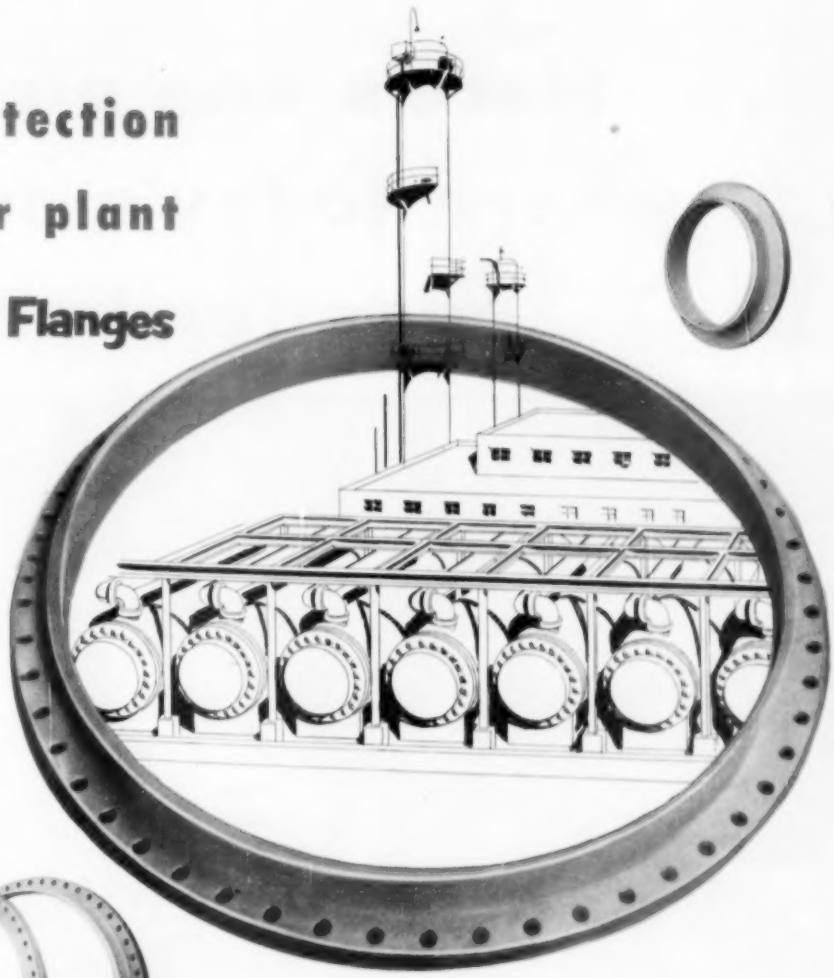
You can easily see the advantages of the 3-D ... 3-Diameter Pin...used in Rex A.P.I. Oil Field Chains. Three individual diameters... *one* under the pin head...*two* on the bushing bearing area...*three* on the cotter end... assure fast, easy field assembly and disassembly. It is necessary only to drive the pin the thickness of a single sidebar. No need for heavy battering with sledge and drift pins. Yet, there is no sacrifice in strength, bearing area or pin life. The Rex 3-D Pin is but one of the many advantages that make Rex A.P.I. Chains "the favorites in the fields." For the complete story, see your supply store or write Chain Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT COMPANY

District Sales Offices and Distributors in all principal cities

rings of protection around your plant

Railway Steel Flanges



For brake rims, gear blanks, sheave rings and circular sections (forged and rolled seamless) of many types, specify "Railway." To assure highest dependability in the finished products, we make the high quality steels in our own plant.

Install large-diameter Railway Steel flanges on your heat exchangers, pressure vessels and piping and you can be sure of maximum protection.

Made from carbon and alloy steels to all recognized American standards, Railway Steel flanges come in standard or special types, all sizes, ranging from 18 in. ID to 150 in. OD.

For full information, call our sales representative in Chicago, Cleveland, Houston, New York, Richmond, San Francisco, St. Louis, St. Paul or Tulsa.*

Ardun Supply Company

Railway Steel Flanges

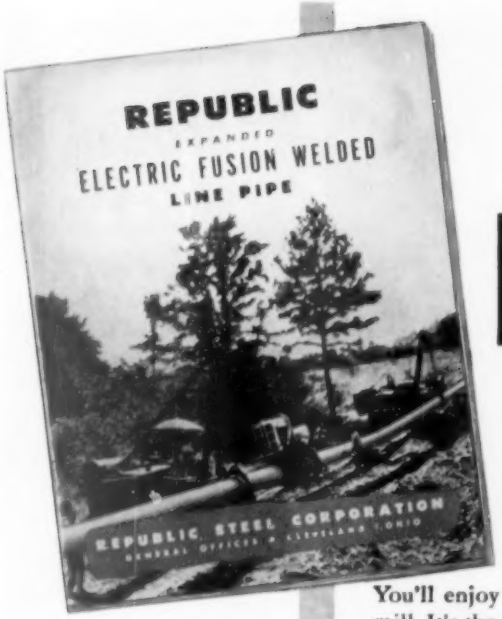
AMERICAN LOCOMOTIVE COMPANY

Here's one place where today's dollar goes further

In the fondly-remembered time of the nickel trolley and the 25¢ T-bone, gasoline for dad's 1925 model cost about 18¢ a gallon (excluding taxes). Sounds like a bargain—yet it really cost *more* than today's gasoline. The reason is clear when you keep this fact in mind: You fill your car's tank with gasoline, but what you're actually buying is *mileage*. Naturally, you'd rather pay $1 a gallon for gas that gave you 100 miles a gallon than buy 10¢ gas that delivered only 5 miles to the gallon. And that's why today's gasoline costs less than motor fuel of 1925 . . . it gives you *more miles to the dollar*. Research by companies such as Standard Oil Company of California has improved gasoline spectacularly over the years. This better motor fuel made more efficient auto engines possible, and together they give you up to 50% better mileage than motorists got in the '20's. On top of that, competition between oil companies has helped to hold down gasoline prices. Since 1925, they've risen only 20% (excluding taxes) while food has gone up 70%, clothing 63%, and the cost of living 53%. Compared to practically anything else you buy, gasoline is still a bargain. Any way you look at it, your money goes further when it goes for today's finer gasoline that gives you more miles to the dollar.

STANDARD OIL COMPANY OF CALIFORNIA

75 years of planning ahead to serve you better



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Pictured within are the latest devices that guard Republic quality, that make Republic big diameter line pipe uniform in strength, accurate in size, constant in circumference, uniform in wall thickness, and dependably straight. Also included in the 24 pages are useful tables of weights, dimensions, and hydrostatic test pressures.

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Republic, for over 25 years a leading manufacturer of line pipe for transmission, gathering, distribution, and product lines, also makes Electric Resistance Weld Line Pipe . . . in sizes 2⅜" through 16" O.D., and Continuous Butt Weld Pipe from ⅛" through 4" nominal. Literature is available on both products. Use coupon below.

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Company_____ Street_____

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"The best mudline valve we've ever used is that new Rockwell-built *MUDWONDER*"

Here are some of the discoveries MUDWONDER users are making —quick, easy disassembly and re-assembly . . . easier, faster valve operation . . . no sanding-up . . . longer service life . . . less down-time . . . reduced maintenance . . . drop-tight shut-off . . . piping hook-ups stay together during inspection or part replacement—in other words, ECONOMY and RUGGED DEPENDABILITY.

Interchangeability of operating parts, a regular feature of all Edward valves, adds to MUDWONDER economy. The self-aligning gate of hard-chromed alloy steel and the one-piece seat insert of buna-N molded integrally to steel wear rings are the same in the 3000 psi WP (6000 psi test) and the 2000 psi WP (4000 psi test) MUDWONDER valves.

Replace troublesome mudline valves by ordering new MUDWONDER valves today.

Your favorite supply store has stock or can quickly fill your requirements from the Edward warehouses in Houston—1515 Fulton Street, phone CHarter 0863—or in East Chicago—1592 West 145th Street, phone East Chicago 231.

Edward Valves, Inc.
Subsidiary of
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1492 West 145th Street
EAST CHICAGO, INDIANA

Send me your latest MUDWONDER catalog and price list for 3000 psi WP (6000 psi test) and 2000 psi WP (4000 psi test) mudline valves.

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OILFIELD POWER... *built to order!*

It's built *big* to perform bigger jobs. It's built with the heavy-duty construction and moderate-speed design typical of all MM Oilfield Engines . . . with the kind of durability that takes cycle peak loadings in stride.

That's the Minneapolis-Moline 800-6A . . . the new six cylinder engine offering $5^{3}/_{16}$-inch bore, 6-inch stroke, and 800 cubic inch piston displacement. With this 800-6A, lower piston speeds for less wear result in longer engine life, less down time and fewer service costs. All of the MM continuous-duty advantages which have proved so outstanding in oil industry operations work for you.

Large oil filters submerged in water-jacketed base pan supply cleaner oil to cylinders and bearings at constant temperature, regardless of load or weather conditions. Controlled temperature provides most complete filtering and elimination of sludge. Shafts, bearings, cylinder block, crankcase, base pan, flywheel, clutch and power shafts are engineered for big capacity to make the 800-6A the sturdiest engine in its size and price class.

For complete performance facts and engineering data on the new Minneapolis-Moline 800-6A Oilfield Engine, write, call or wire

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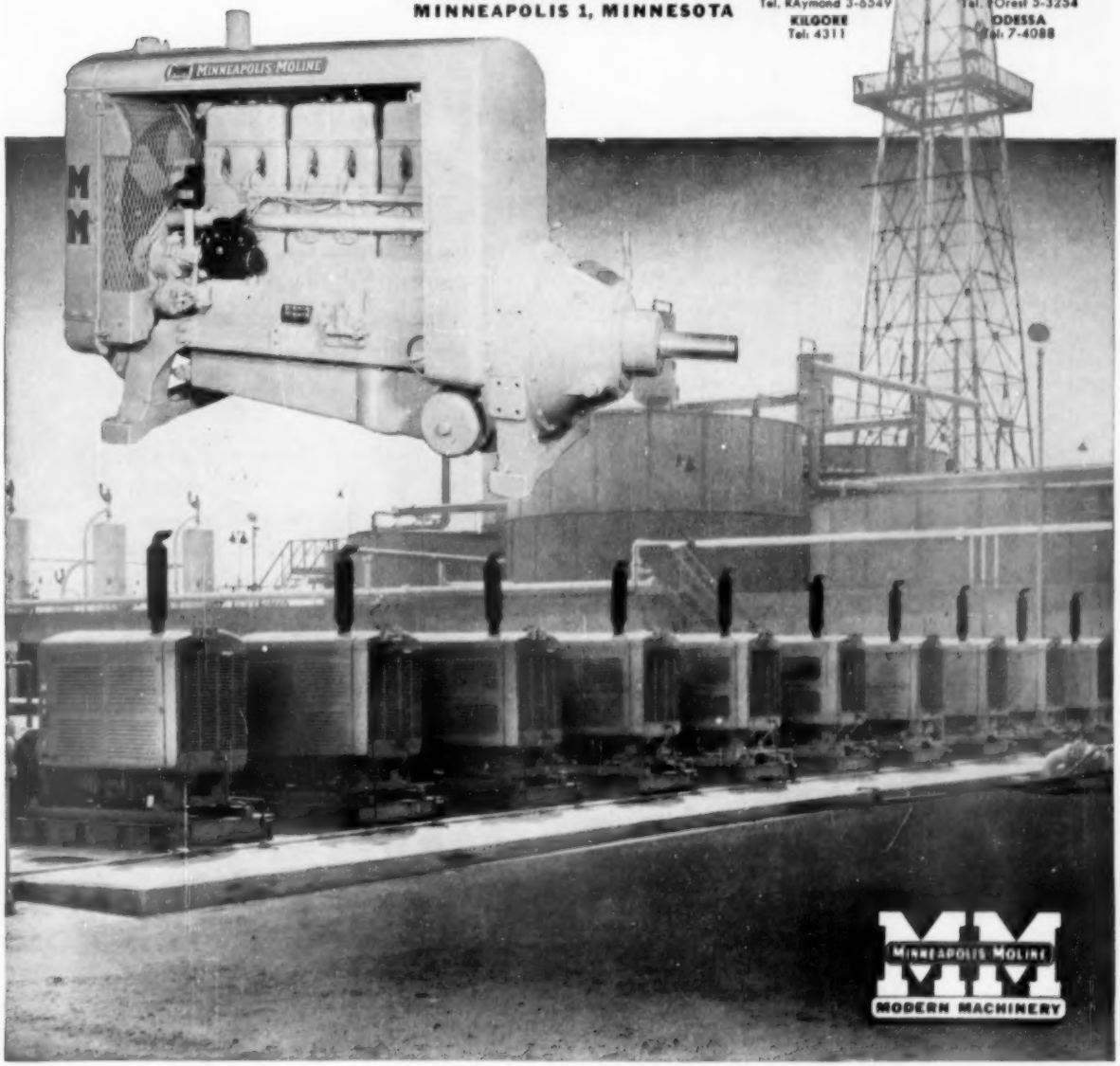

PULL A VACUUM AND SWAB THE WELL CLEAN

with GUIBERSON GW CUPS

GW Cups Assembled on famous Guiberson K Swab

Save time . . save money . . save fluid . . . with GW cups . . . with K Swabs —products of Guiberson's more than a third century's experience serving the oil industry.

If you want to *swab*—not just agitate—flexible Guiberson GW cups on the Type K Swab will pull every drop. They hug the casing wall — provide automatic seal and controlled pipe contact — pull a vacuum and clean the well!

Precision molded in Guiberson's own rubber plant from special abrasion resistant compound, GW cups take up their own wear. Made up on the K Swab, they are unexcelled in rough or mixed casing strings — for unloading shallow wells. Won't down-swab or hang on casing collars. Interchangeable on famous K Swab.

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GUIBERSON

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ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

They Say—

The Gas Price Freeze . . .

. . . Some Like It

" This is the first sign of life I've seen in the Federal Power Commission in several years. I'm glad to welcome the resuscitation of the dead."

Sen. Paul Douglas of Illinois.

"I believe this action will have real meaning to Michigan consumers of natural gas in preventing rate increases."

Sen. Homer Ferguson of Michigan.

. . . Others Don't

"It's the type of thing we've been battling against all this federal control. It makes necessary further action by Congress because the federal Natural Gas Act specifically exempts producers from this regulation."

Gov. Allan Shivers of Texas.

"Hundreds of small one-well producers will be so wound up in federal red tape and regulations that they must give up and get out of business. (It will mean) financial ruin for a large segment of the Texas natural-gas industry."

Atty. Gen. John Ben Shepperd of Texas.

"There are not enough lawyers in Washington to handle the matters involved and the FPC could not carry out the order with a staff 10 times as large as its present one.

"This action by the commission in an attempt to implement the ill-advised decision of the Supreme Court illustrates how foolish both the decision and the effort are. Neither the Congress when it passed the Natural Gas Act of 1938 nor the commission as administrator ever since had any such action or operation in mind. It all adds up to the necessity for corrective legislation by Congress at an early date."

Sen. Robert S. Kerr of Oklahoma.

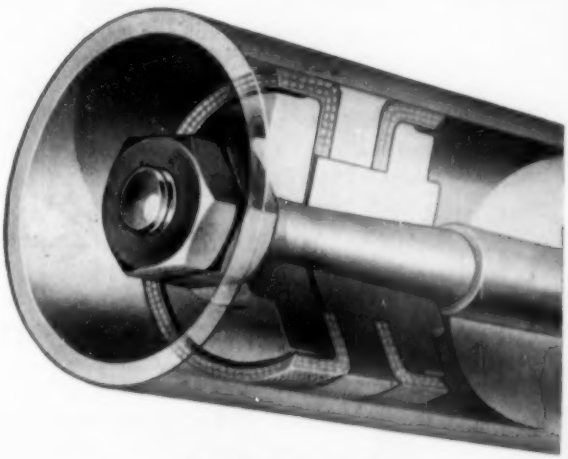
"It is difficult to understand this action. It gives the impression of almost frenzied haste.

"The commission acted without waiting for final action by the Supreme Court on the request of the State of Texas and others for a rehearing of the Phillips decision. The commission also acted without waiting for the President to reply to my proposal for creating a commission to study the problem.

"This decision will certainly create confusion and red tape . . . in the natu-

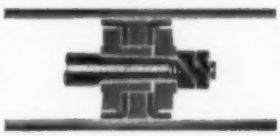
DARCOVA PUMCUPS

more efficient...job after job!

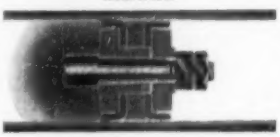


Phantom cutaway showing a typical Pumcup piston assembly.

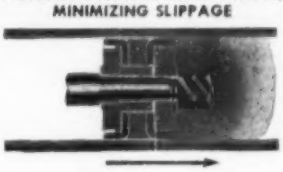
DIAGRAM OF DARCOVA PUMCUP ACTION (greatly exaggerated)



NORMAL: BOTH PUMCUPS RELAXED



UNDER PRESSURE: PUMCUPS SEAL AGAINST CYLINDER DESPITE WEAR, MINIMIZING SLIPPAGE



NO matter how tough your pumping problem Darcova Pumcups can help solve it . . . this has been proved in thousands of plants year after year.

Darcova Pumcup Advantages

1. Texture engineering that not only increases volumetric efficiency, but keeps it high with no appreciable fluid slippage for the entire life of the Pumcups.

2. Darcova Composition Pumcups give many times the life of other types of piston packing . . . *at least 3 to 1!*

3. Standard or special compositions are available for exceptional stability in handling almost *any* fluid . . . strong acids, alkalies, food products and even troublesome petroleum derivatives.

Send For Free Bulletin—Ask for Bulletin No. 4401 on Pumcups for reciprocating pumps; Bulletin No. 4502 on Pumcups for air and hydraulic mechanisms. Address . . .

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DARCOVA® THE ORIGINAL COMPOSITION CUP PUMCUPS

The measurable advantages of Ross specially engineered exchangers

1 Thirty-five years of accumulated engineering experience qualify Kewanee-Ross to solve *your* heat exchanger problems readily, no matter how highly specialized they are.

2 Comprehensive standardization makes available a large selection of flanges, shell and floating head covers, tube sheets, tube layouts, shell and channel sizes and other components in a wide range of working pressure to meet most requirements.

3 Capacity for special exchanger production has been measurably increased with the addition of another large plant at Kewanee, Illinois. Favorable delivery promises can be made — *and kept.*

Why not arrange for consultation with the Ross exchanger representative nearest you? You will find him both competent and cooperative.

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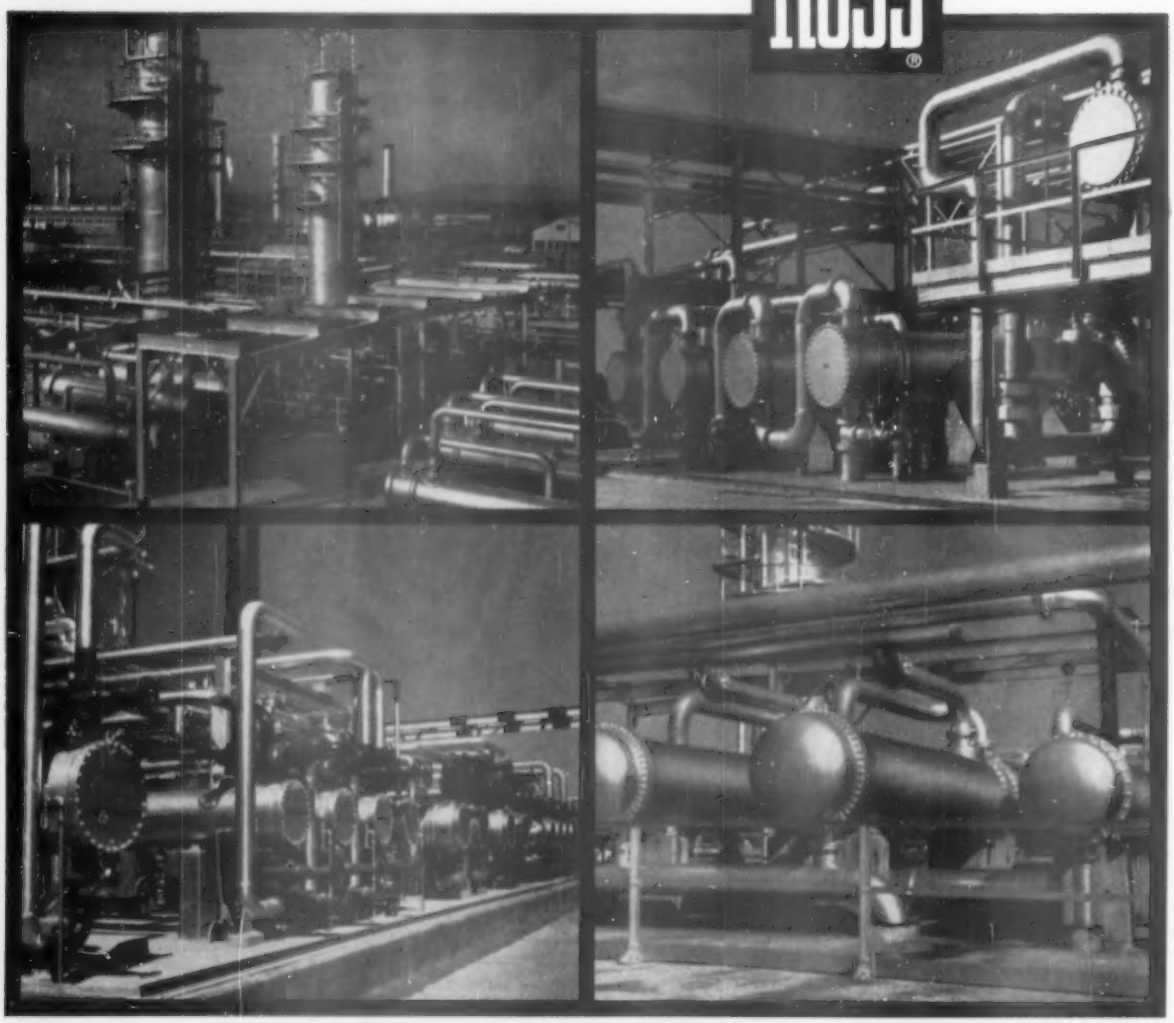

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ral-gas industry. I don't know how many small producers will be able to survive this blow. It is a distinct blow to Texas and other gas-producing states of the Southwest."

Sen. Lyndon B. Johnson of Texas.

"The order . . . emphasized the effect of the Supreme Court decision in the Phillips case, and makes it absolutely necessary that legislation amending the gas act be adopted at the next session of Congress. It was never the intent of either Congress or the commission itself that prices of natural gas at the production level should be regulated by the government agency in Washington."

Sen. Price Daniel of Texas.

"It will destroy the incentive to drill wells and produce gas. Gas prices ought to be allowed to seek their own level—that's part of the free-enterprise system."

Floyd Green, conservation attorney for the Oklahoma Corporation Commission.

"Texas and other producing states will not take this unbridled federal power grab lying down.

"The order . . . constitutes an unprecedented discrimination against one segment of the industry.

"This points up the need for immediate action on both state and national levels. It is a case of slapping on a price ceiling in the face of a virtually limitless market for this finest of all fuels before the price is allowed to become competitive."

Jack Woodward, Dallas, president of the Texas Independent Producers and Royalty Owners Association.

Wants Texas-West Coast Line

"I am deeply concerned with the recent press release citing the necessity of California refiners to 'wildcat' in Peru and Canada to meet their crude-oil deficiency while Texas is forced to make another drastic reduction of allowables for August following a 190,000-bbl. per day reduction in July.

"I think it is extremely urgent . . . for the crude-short refineries on the West Coast and the West Texas producers . . . to get together and build a big-inch pipeline connecting the greatest reserves in the Western Hemisphere with the fastest-growing petroleum market in America.

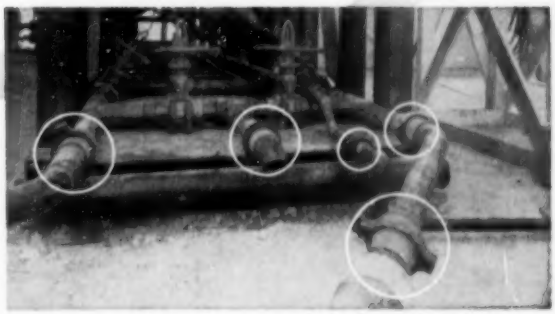
"Especially is this important if the reports of oil-company economists are correct in forecasting a 47 per cent increase in civilian demands for petroleum products on the West Coast during the next 10 years."

Texas Railroad Commissioner Olin

This efficient blowout preventer control manifold uses 1" WECO Fig. 602 Unions and Chikson 1" style 50 High Pressure Swivel Joints.

WECO UNIONS

PAY OFF in Service and Dependability



WECO Fig. 602 Unions on the rig's mud line.

WECO Unions pay their way many times over in longer life, trouble-free service and leak-proof sealing. The time and work saved in rigging-up and tearing-down mean more savings for you.

The WECO Fig. 602 Union is an outstanding example. Strong, tough and compact, it withstands the severe conditions and high pressures of present day deep drilling. Its steel-to-steel Ball and Cone Seat is protected by a replaceable, resilient seal ring.

These photos show some of the WECO Fig. 602 Unions used exclusively on a 10,000-ft. rig recently shipped to a foreign country.

PESA

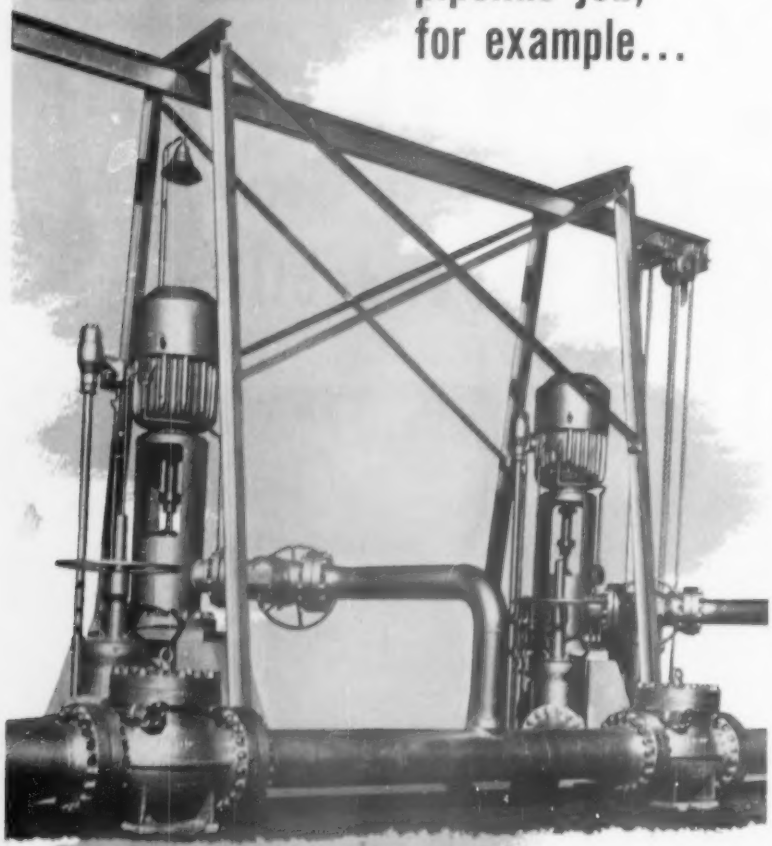
it's wise to standardize with... WECO

WECO®

WELL EQUIPMENT MFG. CORP. • Division of Chikson Company • HOUSTON 1, TEXAS

You can't beat
A JOHNSTON DEALER
for pump know-how . . .

Take this crude oil pipeline job, for example...



■ These two Johnston main line pumps are installed for The Texas Pipeline Company at Houma, Louisiana. They are 100 horsepower units designed to move 790 gallons of .84 specific gravity crude against a head of 418 feet.

Among the many money-saving features built into these Johnstons is a special adjustable flange type coupling between motor and pump shafts that permits removal of the Type P. S. Mechanical Seal without removing the motor or disconnecting the pump.

This job is typical of the kind of money-saving know-how you get from a Johnston Dealer — in this case, the Oil and Gas Supply Company of Houston, Texas.

JOHNSTON PUMP COMPANY
Bin "K", Pasadena 19, California

☐ Please send your Bulletin P-84

☐ Have your representative call

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CITY _____ ZONE ____

STATE _____

JOHNSTON VERTICAL PUMPS

For complete details about Johnston Pumps mail the Coupon today.

Culbertson in a statement during a proration hearing of the commission.

A Question and the Answer

Dear Sir:

With your recent issue you asked me to let you know how the fine little yellow book was arriving. Well to be candid, some of the covers are very badly torn and some are OK. But, I think that if the (wrapping) papers were a bit heavier, there would be no torn covers, but on the other hand, look at the distance they have to come and the rough handling some mails get . . .

C. Warburton
Sunnybank, Queensland,
Australia.

Editor's Note: In June, the Journal started using a heavier wrapping paper for its international deliveries. We hope the torn-cover problem has been solved.

Oil for Another War

". . . More than 50 per cent of the total war material shipped from this country in World War II was petroleum products. In some individual operations, the percentage was as high as 80 per cent. Oil is the lifeblood of victory.

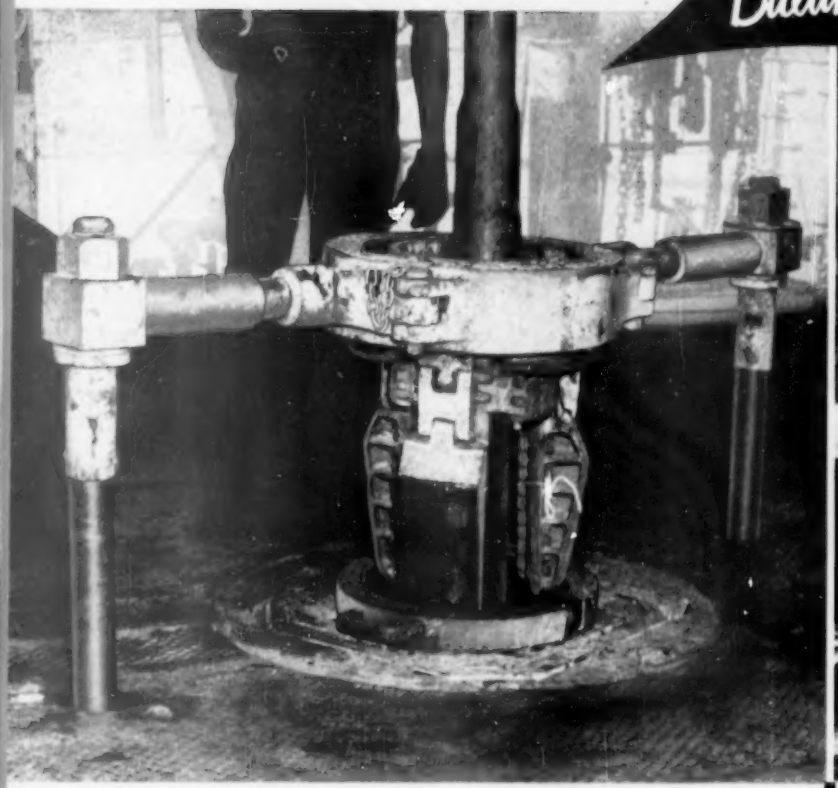
"If . . . we should have to fight another all-out war, the requirements for petroleum may be even greater than they were in World War II. Today's military reciprocating-engine planes . . . consume four, five, and even six times as much fuel as the now-obsolete planes of World War II. And the gasoline they need is of much higher quality . . .

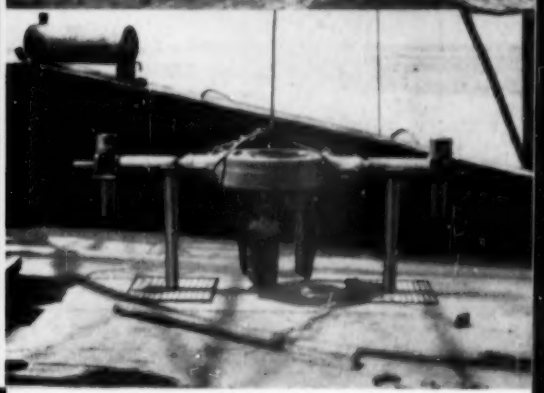
"A long war, fought with supersonic planes, will . . . require at least two million barrels of jet fuel a day. When you consider that the total military and civilian requirements of petroleum products in this country in 1953 came to 7.6 million barrels per day, you can see that the estimated requirement for jet fuel alone in case of prolonged war would be approximately 26 per cent of this 1953 total. Other petroleum uses by the military would probably increase this requirement to approximately 35 or 40 per cent of our 1953 demand. . ."

John W. Boatwright, general manager, distribution economics department, Standard Oil Co. (Ind.), in an address before the Stanford Business Conference, Stanford University, Palo Alto, Calif.

WEB WILSON *Power Slips**

Balanced





(TOP) Showing slip assembly swung away from the rotary table on one of the supporting posts; the other has been retracted and covered with steel safety plate. (BOTTOM) Slip assembly has been lifted by the catline and set on the stand provided; *both* posts have been retracted and covered with steel safety plate.

"Balanced" for improved operation and longer life

Web Wilson Power Slips are "balanced" between two supporting posts mounted to opposite sides of the rotary table. There are no cantilever arms. Accurate alignment is assured—and all adjustments are made at the time of installation. Unique "free-floating" slip support does *not contact* the lifting ring during rotation. Thus there are no bearings or rollers to gall or wear.

Web Wilson Power Slips are quickly swung to one side on either of the supporting posts. It is not necessary to "strip" slip bowls or guide rings over the pipe. While drilling, the entire slip assembly can be lifted aside, and the supporting posts retracted, leaving the derrick floor *completely* clear.

Web Wilson Power Slips are easily installed, quickly dismantled or moved. Ruggedly built, with a minimum number of wearing parts, they require little maintenance.

Contact your Web Wilson sales agent or write today for additional information on time-saving, money-saving *Web Wilson* BALANCED *Power Slips.*

Balanced between two pistons
"Free Floating" slip support
Derrick floor clear while drilling
"Swing-Away" Gate
Rugged, Simple, Few Parts

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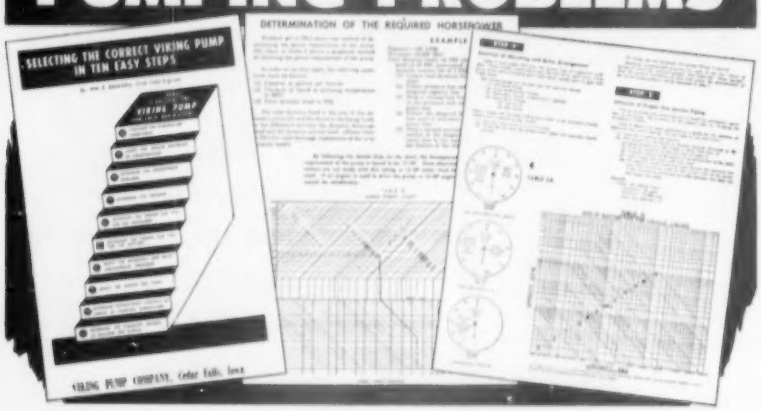

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CALENDAR OF EVENTS

AUGUST

13 Southern Gas Association, pipeline operations and engineering conference, Rice Hotel, Houston.

16-17 North Dakota Oil and Gas Association, second annual convention, Bismarck, N. D.

16-18 Society of Automotive Engineers, West Coast annual meeting, Statler Hotel, Los Angeles.

20 Southern Gas Association, conferences on natural-gas gathering and natural-gas processing, Captain Shreve Hotel, Shreveport.

20-21 Southern Gas Association, natural-gas processing and pipeline operations conference, Herring Hotel, Amarillo, Texas

23-25 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

26-28 (tentative) Intermountain Association of Petroleum Geologists, fifth annual field conference, beginning at Price, Utah.

27-28 Joint meeting, reserves committees of A.G.A., A.P.I., Canadian Petroleum Association, Banff, Canada.

SEPTEMBER

6-11 American Chemical Society, national meeting, Conrad Hilton Hotel, Chicago

7-9 Association of Desk and Derrick Clubs of North America, annual convention, Banff Springs Hotel, Banff, Alta.

8-10 Pacific Coast Gas Association, sixty-first annual meeting, Vancouver Hotel Vancouver, B. C.

9-11 Interstate Oil Compact Commission Omaha, Neb.

10 Southern Gas Association, conference on compressor-station operation, Jung Hotel, New Orleans.

12-16 American Institute of Chemical Engineers, Colorado Hotel, Glenwood Springs, Colo.

13-14 Independent Natural Gas Association of America, annual meeting, Roosevelt Hotel, New Orleans.

15-16 American Gas Association, sixth annual accident-prevention conference, Bond Hotel, Hartford, Conn.

15-17 American Petroleum Institute, lubrication committee, Traymore Hotel, Atlantic City, N. J.

15-17 National Petroleum Association, fifty-second annual meeting, Traymore Hotel, Atlantic City, N. J.

16-17 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

17 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

23-24 Western Petroleum Refiners Association, regional meeting, Henning Hotel, Casper, Wyo.

27-28 Symposium on Methods for Testing Liquefied Petroleum Gases (ASTM D-2; ASTM D-3, CNGA & NGAA), Statler Hotel, St. Louis.

27-29 Electrical Conference for Petroleum Industry, American Institute of Electrical Engineers, Mayo Hotel, Tulsa

27-30 Ninth Annual Petroleum Mechanical Engineering Conference, petroleum division of the American Society of

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NAME.....

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Mechanical Engineers, Statler Hotel, Los Angeles.

28-29 Texas Mid-Continent Oil and Gas Association, Baker Hotel, Dallas, Tex.

30 Southern Gas Assoication, conference on transmission management, Shamrock Hotel, Houston.

OCTOBER

1 Southern Gas Association, conference on gas pipeline rights-of-way, Rice Hotel, Houston.

1-2 Standards Engineers Society, annual meeting, Haddon Hall, Atlantic City, N. J.

3-7 ASTM Committee D-2 on Petroleum Products and Lubricants, Sheraton Park Hotel, Washington, D. C.

4-6 Texas Mid-Continent Oil and Gas Association, annual meeting, Plaza Hotel, San Antonio, Tex.

4-6 Petroleum Electric Power Association, twenty-sixth anniversary meeting, Jung Hotel, New Orleans.

5-7 American Institute of Electrical Engineers, Middle Eastern district, Abraham Lincoln Hotel, Reading, Pa.

6-8 Eighteenth Technical Conference on Petroleum Production, Pennsylvania State University, State College, Pa.

7-8 California Natural Gasoline Association, twenty-ninth annual fall meeting, Ambassador Hotel, Los Angeles.

7-8 American Institute of Mining and Metallurgical Engineers, Pacific Petroleum chapter, fall meeting, Biltmore Hotel, Los Angeles.

10-13 American Association of Oilwell Drilling Contractors, fourteenth annual meeting, Biltmore Hotel, Los Angeles.

10-16 Oil Progress Week.

11-13 American Gas Association, annual convention, Atlantic City, N. J.

11-17 Permian Basin Oil Show, Odessa, Texas

12-15 Eighth National Chemical Exposition, Chicago Coliseum, Chicago.

14-15 National Association of Corrosion Engineers, South Central region, Dallas.

14-17 Permian Basin Oil Show, Odessa, Tex.

17-20 American Institute of Mining and Metallurgical Engineers, petroleum division, fall meeting, Plaza Hotel, San Antonio.

18-19 Joint Lubrication Conference, American Society of Mechanical Engineers and American Society of Lubrication Engineers, Lord Baltimore Hotel, Baltimore.

21-22 Western Petroleum Refiners Association, regional meeting, Garrett Hotel, El Dorado, Ark.

24-26 Independent Petroleum Association of America, annual membership meeting, Mayo Hotel, Tulsa.

25-27 Diesel and Gas Engine Power Plant Operators Conference, sixth annual conference, Oklahoma A. & M. College, Stillwater, Okla.

25-27 National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco.

26-28 Society of Automotive Engineers, national diesel engine meeting, Statler Hotel, Cleveland.

29 Natural Gasoline Association of America, southern regional meeting, Blackstone Hotel, Tyler, Tex.

NOVEMBER

1-3 Geological Society of America, annual meeting, Statler Hotel, Los Angeles.

3-5 Gulf Coast Association of Geological Societies, fourth annual meeting, Rice Hotel, Houston.

4 American Association of Oilwell Drilling Contractors, third annual South Louisiana safety clinic, New Iberia, La.

4-5 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

5 Southern Gas Association, conference on field production of natural gas, Herring Hotel, Amarillo.

8-11 American Petroleum Institute, thirty-fourth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

11-12 American Association of Petroleum Geologists, Pacific section annual meeting, Biltmore Hotel, Los Angeles.

17-18 North Texas Section, American Institute of Mining and Metallurgical Engineers, and Production Committee of the North Texas Oil and Gas Association, symposium on secondary recovery, Wichita Falls, Tex.

18-19 National Association of Corrosion Engineers, fourth annual conference of western region, Hotel Biltmore, Los Angeles.

18-19 Society of Exploration Geophysicists, eighth annual midwestern meeting, Adolphus Hotel, Dallas.

28-Dec. 3 American Society of Mechanical Engineers, Statler Hotel, New York.

DECEMBER

2-4 Interstate Oil Compact Commission, winter meeting, Drake Hotel, Chicago

2-4 American Chemical Society, Southwest Regional meeting, Fort Worth, Tex.

3 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

12-15 American Institute of Chemical Engineers, annual meeting, Statler Hotel, New York.

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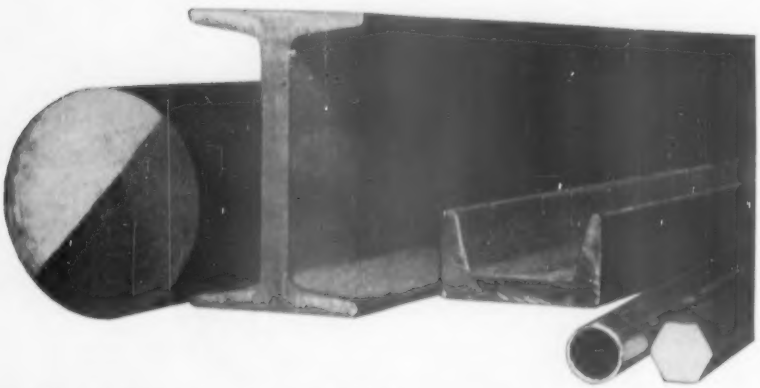

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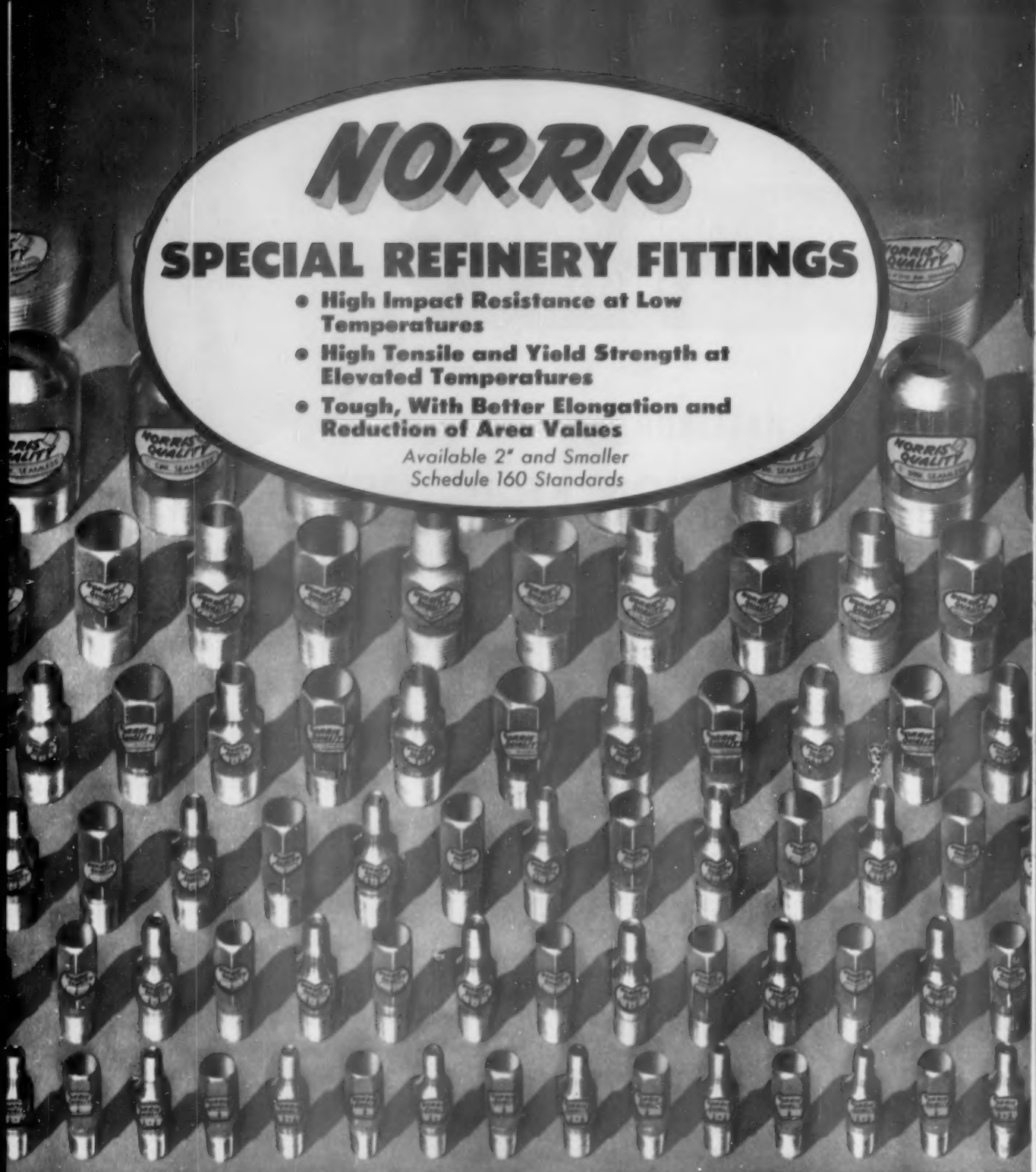

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THE OIL AND GAS

JOURNAL

TULSA, OKLAHOMA

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JOURNALLY Speaking

Old Stapleton

THE next time somebody says we're running out of oil, tell him about Old No. 1 Stapleton. A famous veteran of the World War I, dead and buried for 20 years, Old Stapleton has kicked off its tombstone and started producing oil again.

It was back in 1915. Europe was at war, and oil was short. A wildcat was drilled on the Stapleton farm near El Dorado, Kans., a region which had produced only small quantities of oil up to then. It hit in a big way. It was the discovery well of the fabulous El Dorado field which put Kansas on the oil map.

Development was fast and furious, and by the time the United States was in the war, El Dorado was one of the biggest producing fields in the country. El Dorado alone produced one-half of all the increased oil production of the United States which Lord Curzon said "enabled the Allies to float to victory on a sea of oil."

Its war service over, Old No. 1 retired to the easy life of a stripper, but the depression was too much for it and this old soldier just faded away. In 1940 it was officially declared dead; and a granite headstone was ceremoniously erected on the site to commemorate its discovery.

Two years ago Cities Service Oil Co., which now owns the Stapleton lease, began a water flood in El Dorado. Recently the flood front reached Old No. 1 and it began to produce oil again. The casing had never been pulled, but there had been no activity there for 20 years.

Today this valiant veteran is producing as much oil every day as the national average of all wells in the country, and engineers expect it to remain a commercial producer for another decade.

Things like that are going on all the time, of course, but few revivified wells dramatize the fact as picturesquely as Old No. 1 Stapleton. As long as the oil industry has science and ingenuity at its command it will refuse to die or even just fade away.

Reverse Twist

SCIENCE is wonderful. A news note from Khalid Askary, Pakistan, reports that in India "scientific research has been able to extract from cow dung a gas that can be utilized for lighting houses and cooking and the residue used for fertilizer."

Science is also versatile. In the United States scientific research has been able to extract fertilizer from gas, thus putting a reverse twist on the combination.

We don't know any details about this Indian gas-from-fertilizer industry, but the pages of our favorite oil publication can tell you plenty about the American fertilizer-from-gas industry. In fact, we've had quite a rash of articles lately about plants and processes for making ammonia and other petrochemicals out of gas.

For some reason — probably the heat — we are reminded of another reverse twist concerning the same commodity. An inmate of an insane asylum saw a farmer hauling a load of manure and asked what he was going to do with it.

"Put it on my strawberries," said the farmer.

"And they call me crazy," said the nut. "I put sugar and cream on mine."

Welcome Relief

THAT last item was really scraped out of the bottom of the barrel, so before it appears in print we're going to skip town for a few weeks. By the time we get back maybe the incident will have been forgotten and we forgiven. Also, maybe, we will have some fresh angles and won't have to rely so much on that accumulation in the bottom drawer.

Meanwhile, this column will be conducted by several of our colleagues, chosen for the honor by lot and who gladly accepted after being treated to the thumbscrew and a cat-o-nine-tails.

The change should be a welcome relief to any readers we still have left. At least we'll welcome the relief.

—Henry D. Ralph.

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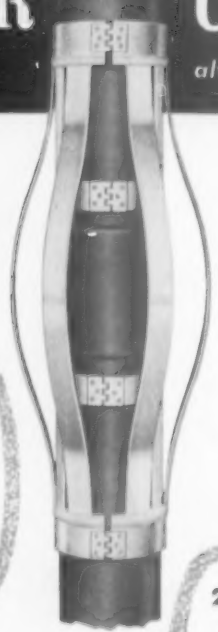
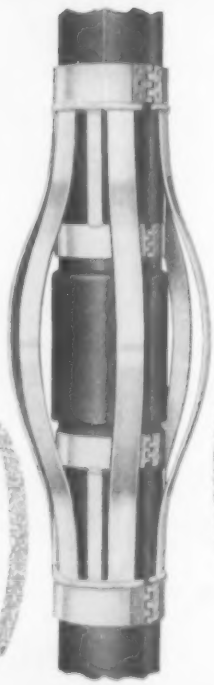
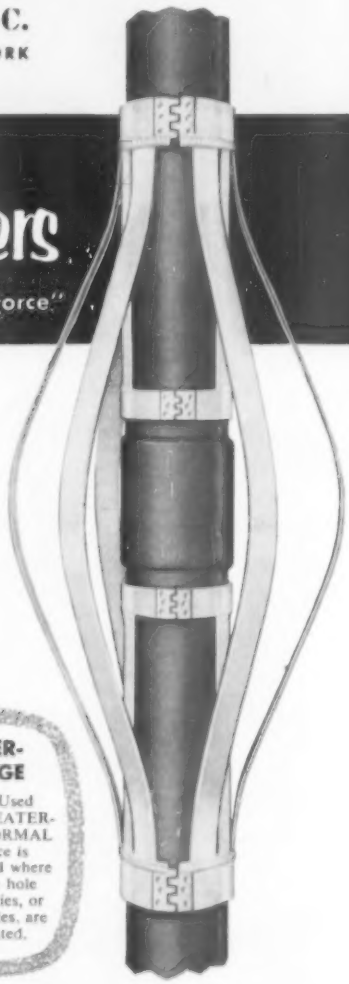


20-RANGE
Used where LESS-THAN-NORMAL clearance is present between the casing ON which centralizers are run and the casing THROUGH which they are run.



25-RANGE
Used where NORMAL clearance is present, and no serious problem of over-size hole is anticipated.



SUPER-RANGE
"H-50" Used where GREATER-THAN-NORMAL clearance is present and where extensive hole irregularities, or even cavities, are anticipated.

Why did FPC go so far so fast?

THE suddenness with which the Federal Power Commission blanketed all gas producers, large and small, under complete and detailed regulation both shocked and perplexed the entire oil and gas industry. Several other courses of action were open to it.

All the time the Phillips case was before the Supreme Court, various individual commissioners gave out the word that this type of regulation was impractical and undesirable, and that FPC would feel its way along one step at a time, conscious of the confusion that would be caused by trying to bring everybody under detailed control at once.

Four days before Order 147 was issued, Chairman Kuykendall told a congressional committee that FPC planned to classify producers according to degree of regulation required and to start by concentrating on a relatively few big suppliers.

BUT WITHIN MINUTES after the Supreme Court mandate was issued, FPC promulgated its 29-page, highly detailed order which obviously had been weeks in preparation. Three possible explanations are suggested:

- FPC was so cowed by the bleating of Michigan politicians and other self-appointed consumer spokesmen that it callously disregarded the consequences of its action and its responsibilities to the industry placed under its jurisdiction.
- The FPC staff is so dominated by holdover New Dealers, zealous bureaucrats, and professional regulators with abysmal ignorance of the producing business, that the commission was swept into slapping an ill-conceived, utility-type straitjacket on this fast-moving and competitive industry.
- Or, perhaps, the commissioners slyly calculated that the confusion and outcry would be so great that Congress will be forced to amend the law quickly and thus relieve both FPC and the industry of the entire unwanted mess.

IN ASKING CONGRESS for an additional $300,000 to hire more lawyers to enforce the Phillips decision, Chairman Kuykendall said: "Undoubtedly litigation will ensue in excess of what had been anticipated when the budget was prepared."

This may go down as the understatement of the year. A myriad legal and practical questions have already been raised by the order, which freezes prices, invalidates many contract provisions, and puts onerous and delaying requirements on routine business activities.

A thousand lawsuits won't settle all the problems suddenly confronting producers. The confusion of litigation and the chaos in operations may well result in the congressional relief postulated in the third suggested explanation.

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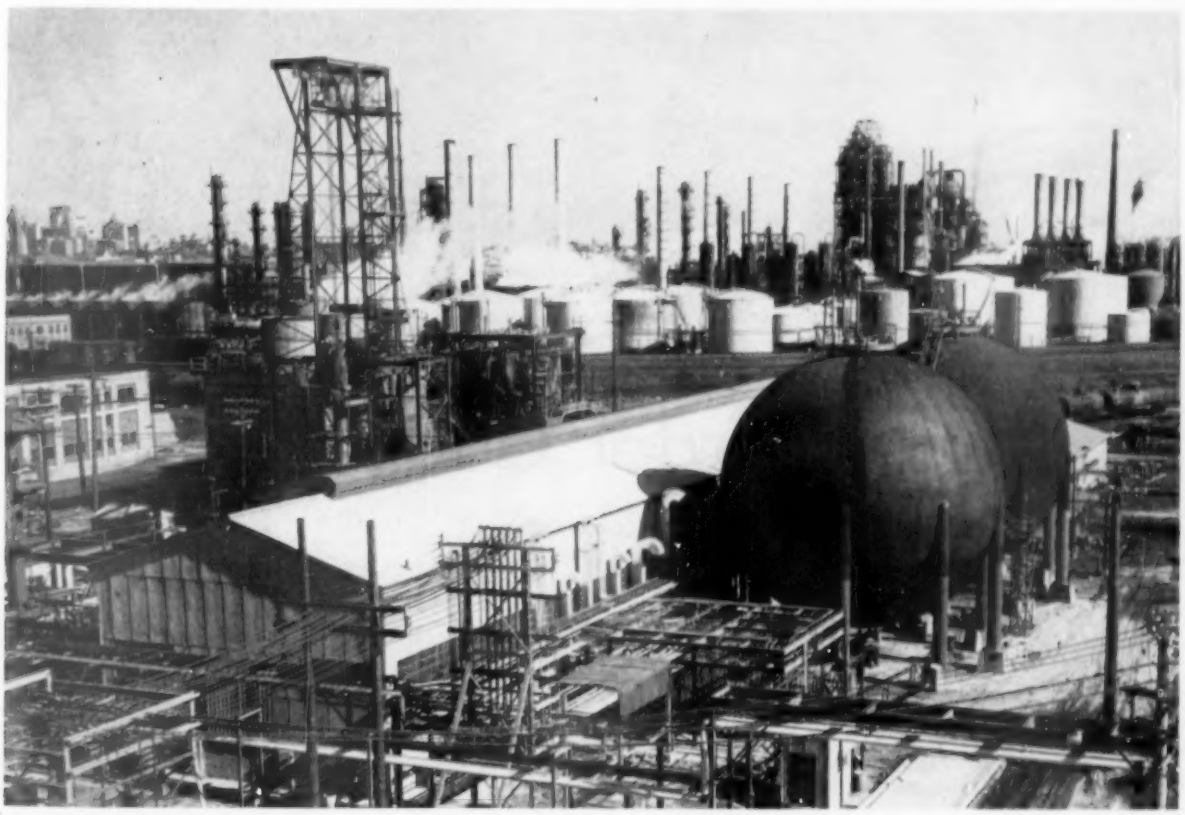
THIS WEEK . . . . . IN THE NEWS



CATALYTIC REFORMER HYDROGEN is being converted into anhydrous ammonia for the first time at Atlantic Refining Co.'s Philadelphia refinery in a new 100-ton ammonia plant. The converter section topped by a derrick structure is shown here to the left of the compressor house. There purified hydrogen and nitrogen are combined at high pressure and temperature. To the right of the converter is the "cold box" where nitrogen and hydrogen are purified by low-temperature fractionation. The spherical tanks will hold a 15-day supply of the product. Atlantic's 11,100-bbl. daily Catformer removes hydrogen from naphthenes present in straightrun naphtha feed stocks, converting them to aromatics and producing an excess amount of hydrogen as feed stock for the ammonia plant.

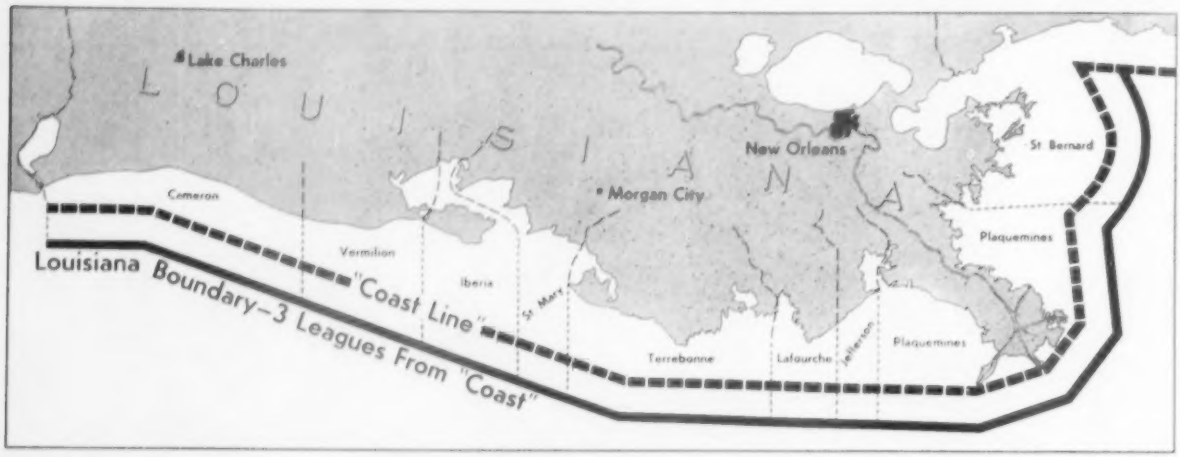
OFFSHORE—Louisiana passes legislation extending its seaward "boundary" into the Gulf of Mexico a distance of 10.35 to 35 miles beyond the coast line as shown on maps in last year's geography books. . . . Louisiana thereby surpasses claims of other coastal states to potentially-rich submerged lands. . . . ¶Continental Oil Co. drills second well from offshore platform in Gulf of Mexico near Cameron, La. . . .

NATURAL GAS—Trans-Canada awards engineering, management, and procurement contract for Alberta to eastern Canada line to combine composed of Oklahoma Contracting Co., Canadian Bechtel, Ltd., and Mannix, Ltd. . . . Conditional permit for line issued by Canadian Board of Transport Commissioners with provisions for December 31 financing and export deadline. . . . ¶Seattle Gas signs contract with Pacific Northwest Pipeline for first natural gas in Pacific Northwest region. . . .

PIPELINES—Texas Eastern unveils plan to reconvert Little Inch to products service and substitute Little Inch natural-gas capacity with 382-mile, 24-in. extension of Big Inch. . . . ¶Construction started on 195-mile Badger products system from East Chicago to Madison, Wis. . . . ¶First work also launched on South Saskatchewan crude line, which is link in system that will move Canadian crude from Fosterton area to St. Paul. . . .

ECONOMICS—Price cut in Oklahoma may mean that a bigger price spread will develop between low and high-gravity crude oils. . . . Across-the-board hikes in recent years have given sour and heavy crudes the same cents per barrel increases, but refiners, already squeezed by soft product markets are taking a sharper look at the economics of processing the poorer crudes. . . . ¶General Petroleum may run Venezuela crude through near-completed Ferndale refinery in favor of Canadian crude. . . . Low tanker rates favor Venezuelan crude as much as 25 cents per barrel or more. . . .

PROCESSING—Du Pont survey shows premium gasoline improved more than regular during last quarter. . . . Average premium octane number jumped 0.4 to 92.8 compared to 0.3 rise for regular. . . . ¶Atlantic Refining opens first routine operation of using tail gas from catalytic reformer as feed stock for anhydrous ammonia plant at Philadelphia.



Louisiana Border Goes Nautical

- **Legislature quietly passes bill placing Louisiana's historical boundary far beyond claims of sister states**
- **New law, based on 1895 act of Congress extending coast up to 25 miles seaward into Gulf, adds 3 leagues more**

F. Lawrence Resen

BATON ROUGE. — In an apparent effort to out-Texas Texas, Louisiana has made a legal bid to extend its jurisdiction over offshore lands as far as 35 miles into the Gulf of Mexico.

Unlike the widely publicized tidelands battle waged by its neighboring state, Louisiana's claim to a larger share of the disputed tidelands attracted little attention outside the Bayou country.

Without any bravado, the Louisiana legislature quietly passed a bill moving the state's "shore line" so far out to sea that it makes its neighbors along the coast look like inland states. The bill, setting the boundary a minimum of 10.35 miles from the coast, has been signed into law by Gov. Robert F. Kennon.

The measure, purportedly based on provisions of the federal Constitution and past rulings of the U. S. Supreme Court, declares that "The historic boundary of the State of Louisiana extends a distance into the Gulf of Mexico three marine leagues from coast."

At first glance, the statute appears similar to the claim of Texas to the 3-league or 10.35-mile limit as its "historical boundary" as defined in the Submerged Lands Act of 1953.

Two boundaries claimed . . . However, Louisiana stresses the distinction between "coast line" and "shore line," pointing out that an Act of Congress in 1895 legally extended the Louisiana coast up to 25 miles into the Gulf. Louisiana claims her present boundary extends 3 leagues beyond that line under provisions of Section 3, Article IV of the United States Constitution under which the state was admitted to the Union and its Gulfward boundary fixed at 3 leagues from the coast.

Under this interpretation, the waters between the "shore line" and "coast line" are inland waters, the same as rivers and lakes.

This was emphasized by Judge L. H. Perez, Plaquemines Parish, in a discussion before the State Mineral Board last March. He said that by the Act of February 19, 1895, Congress authorized the Secretary of the Treasury to designate and define by suitable hearings with lighthouses, light vessels, buoys, or coast objects "the lines dividing the high seas from rivers, harbors and inland waters."

The Supreme Court held in a New York case in 1896 that the channel inside the line as designated was "as much a part of the inland waters of the United States within the meaning of the act as the harbor within the entrance," Judge Perez noted.

Line defined . . . In the 1953 Tidelands Act, as well as the earlier law, "coast line" is defined as "the line marking the seaward limit of inland waters" which is in "direct contact with the open sea," he said. Furthermore, the Tidelands Act recognizes state ownership of its tidelands and resources in such lands and waters within the seaward boundaries of a state as extending from the coast line not more than 3 marine leagues into the Gulf of Mexico.

With reference to the 1895 act, the coast line is officially designated in the new state law as follows:

"From Ship Island Lighthouse to Chandeleur Lighthouse; thence in a curved line following the general trend of the seaward, high-water shore lines of the Chandeleur Islands to the southwesternmost extremity of Errol Shoal; thence to Pass-a-Loutre lighted whistle buoy 4; thence to Ship Shoal Pass lighted whistle buoy 2; thence to Southwest Pass entrance midchannel lighted whistle buoy; thence to Ship Shoal lighthouse; thence to Calcasieu Pass lighted whistle buoy 1; thence to Sabine Pass lighted whistle buoy 1."

Precedent cited . . . Perez claims a precedent to Louisiana's claim has been established in international law, as well as federal law.

In December, 1951, he said, the International Court of Justice held that the sea 50 to 75 miles off Norway's shores was part of that country's internal waters because of an historic title based upon royal decrees issued between 1812 and 1935. Therefore,

Perez says, Louisiana's historic boundary extends 3 leagues from its coast as noted when Congress admitted the state into the Union in 1812.

Recent Louisiana legislation also defines Parish offshore boundary extensions to coincide with the newly proclaimed state boundaries. (See map).

Although it is too early to predict effect of Louisiana's surprise legislation, the measure is virtually certain to be contested, especially in view of Texas' current difficulties with the federal Government over ownership of the tidelands *(The Oil and Gas Journal, July 26, page 137).*

Some Louisiana attorneys believe the state has a valid precedent to uphold its boundary claims. But they admit any oil operator venturing to drill beyond the traditional 3-mile limit from the coast had better be prepared to deal with two masters for some time to come.

Discovery Assured

Mississippi strike flows up to 748 bbl. per day

JACKSON, Miss.—Opening of first commercial oil production in Mississippi's Hinds County became virtually assured last week.

Larco Drilling Co.'s previously indicated discovery well near Bolton, 12 miles west of here, kicked off naturally and during a series of preliminary 1½-hour gages through various-sized chokes flowed at rates ranging up to 748 bbl. per day. *(See page 137, this issue.)*

The 748-bbl. daily flow rate was through ¼-in. choke. Flowing pressure was 790 psi. and gas-oil ratio 308:1. In successive 1½-hour gages through reduced-sized chokes, daily flow rates were: 12/64-in. choke, 545 bbl.; 10/64-in., 633 bbl.; 8/64-in., 274 bbl., and 6/64-in., 172 bbl. Pressure through the smallest choke was 1,100 psi. Gravity of the oil ranged from 34.9° to 38.3°, varying with the different rates of flow. There was no evidence of any salt water.

Producing sand is in the Lower Cretaceous-Paluxy formation, in which casing is perforated at 9,920-40 ft. Bottom of the hole at 9,951 ft. is still in the pay. Perforations are in the lowermost of a series of sand zones in the same formation in which indications of commercial production were given during drilling operations. *(For details of this significant strike, see Frank Gardner's comments on page 137.)*

Pump Goes to the Car in the . . .

. . . Latest Idea in Marketing

GARDEN CITY, Kans.—The newest idea in marketing—servicing the housewife's car while she buys her groceries—is being tried out here this week by Deep Rock Oil Corp.

The revolutionary idea involved: Take the gasoline pump to the car instead of waiting for the car to come to the pump.

To do it, Deep Rock has sunk tanks in the concrete parking lot at a large supermarket here and placed connections at scattered points over the lot. When a housewife drives up an attendant will be on hand to fill her tank while she selects her groceries. The attendant rides a scooter which carries a fuel line for connecting to one of the storage outlets and to the car. The gasoline is metered as it passes through the scooter.

The "Shop 'n Gas" system, as Deep Rock calls it, also is prepared to change oil and perform most other services.

This week's operation, at Walls Foodliner here, is a quiet experiment to determine two things: Whether the housewife will use the convenient new station, and whether the novel equipment designed for the Shop 'n Gas system will perform as expected.

If both answers are an emphatic "Yes," Deep Rock visualizes a rapid spread of the systems over the nation's supermarket parking lots.

Planning of the new station has been under way more than 2 years. One of the chief attractions was the apparent "wasted" space of the parking lot. The grocer, forced by competition to provide parking areas, has watched as parking space vastly outstripped his shopping space, and he has furrowed his brow over ways to get more utility out of the parking area.

The unique service-station idea, Deep Rock thinks, may be a big help to both the gasoline and the grocery salesmen.

Field Development Ceases

HOUSTON.—Pan American Production Co. has suspended development of its big South Pecan Lake gas-distillate reserve in southeast Cameron Parish, Louisiana, "for the time being."

Calculated potentials of wells already drilled indicate they will produce sufficient gas to meet the company's commitments to Gulf Interstate Pipeline Co. for the remainder of the year. Pan American plans to resume drilling in the area next year.

Conoco Offsets Discovery

HOUSTON.—Drilling is progressing below 600 ft. at Continental Oil Co.'s second venture from an offshore drilling platform in the Gulf of Mexico near Cameron, La.

First well drilled from the platform flowed at the rate of 4,150,000 cu. ft. of gas and 41 bbl. of condensate daily from the upper Miocene sand through perforations at 8,810-22 ft. The well, bottomed at 14,040 ft., is on a 15,000-acre tract in Block 192 field.

Tower Begins Trip to Texas Co. Refinery

This 87-ton welded fractionating tower, 9 ft. wide at the base and 151 ft. high is loaded for shipment to the Texas Co. refinery at Westville, N. J., from Bethlehem Steel Co.'s plant at Bethlehem, Pa. The size of the tower, indicated by the men standing alongside, made shipment on three full-sized railroad cars necessary.

Little Inch Shift Asked

Texas Eastern hopes to reconvert 20-in. line to products, step up gas capacity of Big Inch with 382-mile extension

SHREVEPORT. — Texas Eastern Transmission Corp. is making a bid to reconvert the Little Inch line to products and become one of the nation's leading carriers of refined products as well as a top carrier of natural gas.

The company has asked Federal Power Commission approval to convert a 1,168-mile section of the 20-in. line to products service and to offset this loss in natural-gas transmission facilities with a 382-mile, 24-in. extension of the Big Inch line. Both lines run from the Gulf Coast to Linden, N. J.

The substitute natural-gas facilities would cost an estimated $71,814,000 while the reconversion of the Little Inch would cost an additional $13,000,000. These expenditures would maintain Texas Eastern's present delivery capacity of more than 1.2 billion cubic feet per day and give the company a daily products capacity of 235,000 bbl.

In addition to becoming a giant in the products transmission business, approval of the Texas Eastern plan would be a heavy blow to another giant—American Pipe Line Co.—before it gets on its feet. American proposes a products line from the Gulf to East Coast, but the line has not been started *(The Oil and Gas Journal, July 5, page 91)*.

The reconversion . . . The section of the Little Inch scheduled for reconversion extends from Baytown, Tex., to Moundsville, W. Va. The line extends further north into Linden, but the Moundsville-Linden section would remain as a natural-gas carrier.

George T. Naff, Texas Eastern president, said the Little Inch is "ideally suited" for products service since the line—along with the 30-in. Big Inch line—was built and operated as a products carrier during World War II. Texas Eastern purchased the two lines in 1947 for $143 million.

Naff pointed out the Little Inch originates in the Baytown-Beaumont refining area and will serve "many important marketing areas" not served by a products line.

Texas Eastern says consumers will save money as a result of the products system. The company said its rates will be "competitive with and lower than" current charges for other forms of transportation.

The company says the shift back to products service also has a defense advantage—a strong factor in the Government's approval of the proposed American system. The company pointed out by reconverting the line in peacetime that it would be available "without delay" for service in case of another war.

The gross book value of the reconverted products system would be approximately $64 million, the company estimated.

New construction . . . The bulk of the proposed new construction is extending the 30-in. Big Inch line to south of Beaumont with 24-in. pipe. This extension would begin at Kosciusko, Miss. The extension would run near Jackson, Miss., cross the Mississippi River north of Baton Rouge, then swing westward to north of Lafayette, La., and drop to south of Beaumont.

Ten compressor stations totaling 86,900 hp. would be constructed. Three of the stations would be located on the proposed 24-in. extension while the remainder would be on present Texas Eastern facilities. The company also plans to boost compressor capacity of existing stations by 36,020 hp.

Construction of 99½ miles of lesser diameter pipeline in the Baytown-Beaumont area also is proposed.

More on American . . . While some observers in the industry have doubted that American will build its proposed line, company officials have been tight-lipped concerning the line. Construction of the line was scheduled to start August 1, but apparently has been delayed.

The line is proposed as a 1,425-mile carrier running from Beaumont to Newark. It would have a capacity of 500,000 bbl. daily, but only about half of the capacity would be used initially.

The Office of Defense Mobilization granted American a 40 per cent accelerated amortization on the $170 million project.

Products background . . . The present plan for shifting the Little Inch back to products service varies slightly from an earlier plan considered by Texas Eastern *(The Oil and Gas Journal, February 22, page 113)*.

This previous announcement was made in conjunction with Texas Eastern's purchase in February of Triangle Pipeline Co., a 276-mile products system running from Carthage, Tex., to Arkansas City, Ark. This was Texas Eastern's first venture into products transmission.

At that time, the company admitted the newly-acquired property was being considered in a long-range plan to reconvert the Little Inch line.

Alaskan Well Drilling

BARTLESVILLE, Okla. — Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., have cemented 10¾-in. casing to 1,503 ft. and are drilling ahead in the second wildcat on a million-acre block of leases on the southern coast of Alaska.

The well, Sullivan 1, was spudded early in July. It is located 7 miles northwest of Icy Cape, where the base camp of the operation is located. The first strat test drilled by Kerr-McGee was abandoned as a dry hole in May at a total depth of 4,837 ft.

Crude Line Tested

BLUE ISLAND, Ill.—Sinclair Pipe Line Co.'s 20-mile crude line between Monee and Blue Island is undergoing final testing before going into operation.

The line, laid by Morrison Construction Co., will deliver crude to Clark Oil & Refining Co. at Blue Island. Earlier this year a 6½-mile, 16-in. section was completed. Now being tested is a 14-mile, 12-in. section.

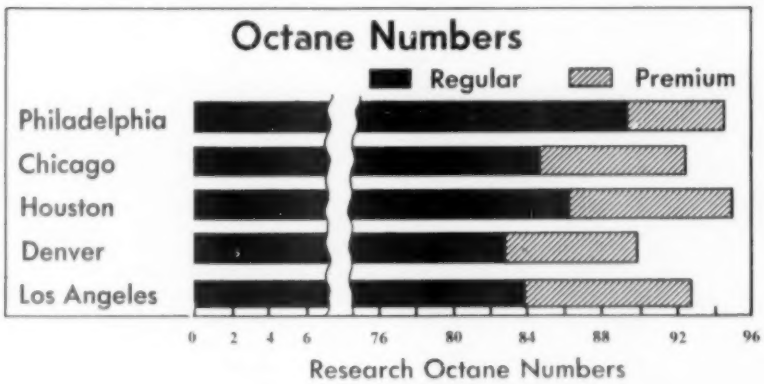
The line replaces a 6-in. line owned by Clark.

Suspension Crossing Begun

GRAND TOWER, Ill.—Work has started here on the steel superstructure for a natural-gas pipeline suspension bridge which will have the longest main span in the world.

The $3,800,000 bridge is also the first suspension pipeline crossing of the Mississippi River. It is being constructed for Texas Illinois Natural Gas Pipeline Co. to support two 30-inch pipelines to supplement the company's present underwater lines and reduce the danger of service interruption due to hazardous river currents.

Octane Numbers Still Gaining



REFINERS have been improving premium gasoline more than regular grades. The latest quarterly survey of the petroleum chemicals division of E. I. du Pont de Nemours & Co., Inc., shows a slightly larger octane gain in the past 3 months for premium than for regular.

The unweighted average of the octane numbers of premium gasoline marketed in 48 cities of the United States and Canada on July 1 averaged 92.8 compared with 92.4 at the first of April. This average increase of 0.4 of an octane number for premium compares with the gain of 0.3 for regular.

Much larger gains are shown over the longer periods included in the small table of general comparisons. Premium gasoline moved up 2.5 octane numbers between July 1952 and July 1954. For the same period regular gasoline was improved by 1.8 octane numbers.

GENERAL COMPARISONS*

	July† 1952	July 1953	April 1954	July 1954
Premium—				
Research Oct. No.	90.3	91.0	92.4	92.8
TEL content (cc. per gallon)	2.22	2.39	2.27	2.43
Regular—				
Research Oct. No.	83.5	84.4	85.0	85.3
TEL content (cc. per gallon)	1.85	2.12	1.94	2.19

*Unweighted averages of 48 cities. †47 cities.

Gains in the use of tetraethyl lead were greater in regular gasoline. In the past 2 years, the TEL content of regular gasoline has increased 0.34 cc. per gallon compared with a gain of only 0.21 for premium.

Gasolines with the higher octane numbers were generally marketed in the Gulf Coast or East Coast areas. There were 16 cities with premium gasolines averaging better than 94 octane. Of this total eight were on the East Coast, five on the Gulf Coast, and the other three were in the Tennessee-Arkansas area.

Both Houston and Nashville had premium gasoline averaging 94.8 octane

COMPARISONS BY DISTRICTS JULY 1954

	Cities in survey	Research Oct. No. Premium	Regular
PAW Dist. 1	8	94.4	88.3
PAW Dist. 2	17	92.8	85.6
PAW Dist. 3	8	93.9	85.1
PAW Dist. 4	4	90.4	82.8
PAW Dist. 5	5	92.2	83.9
Total U. S.	42	92.8	85.3
Canada	6	91.1	85.3

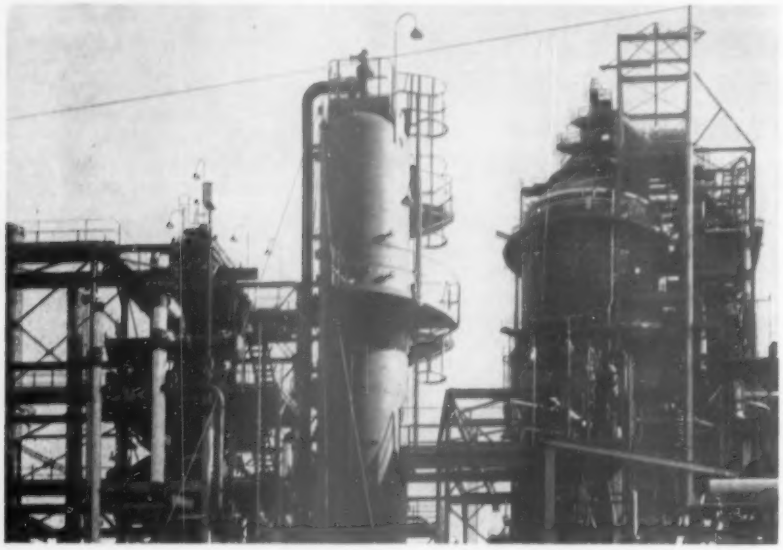
COMPARISON OF MOTOR-GASOLINE SURVEYS

(Octane numbers are by research method, arithmetic averages by cities.)

	Premium				Regular			
	Octane number			TEL cont. cc./gal.	Octane number			TEL cont. cc./gal.
	July 1953	April 1954	July 1954	July 1954	July 1953	April 1954	July 1954	July 1954
Aberdeen	89.4	90.7	91.5	2.40	83.4	83.7	84.6	2.18
Amarillo	88.6	90.0	91.7	2.52	81.1	82.4	83.8	2.54
Atlanta	92.6	94.5	94.5	2.33	85.8	86.2	86.3	2.41
Bakersfield	89.1	90.7	91.3	2.89	80.7	82.4	83.7	2.03
Baltimore	93.0	94.5	94.5	2.66	87.6	88.4	89.2	2.31
Boston	92.4	94.1	94.4	2.28	87.7	88.4	89.3	2.42
Calgary	87.9	88.3	88.7	2.88	82.4	83.0	82.3	2.59
Casper	89.1	90.1	90.4	1.68	81.8	82.7	83.1	1.40
Charlotte	92.1	93.9	94.5	2.26	85.8	86.1	86.9	2.46
Chicago	90.1	92.0	92.4	2.43	84.1	84.6	84.7	2.25
Cincinnati	92.0	92.8	93.4	2.58	86.6	87.7	87.8	2.72
Cleveland	92.4	93.2	93.2	2.32	87.7	88.2	88.4	2.09
Columbus	92.1	93.0	93.1	2.70	87.5	87.6	87.9	2.13
Corpus Christi	91.9	94.1	94.1	2.54	84.7	86.3	85.4	2.32
Dallas—Fort Worth	92.1	94.5	94.6	2.73	84.3	85.7	85.9	2.38
Denver	89.1	89.8	89.9	1.74	80.8	82.1	82.7	1.55
Detroit	92.5	93.3	93.6	2.58	86.6	87.8	87.6	2.06
Edmonton	88.6	90.0	89.8	1.82	82.9	83.8	83.8	1.37
El Paso	89.3	91.2	92.4	2.51	80.4	82.7	82.6	2.33
Great Falls—Billings	91.0	91.5	91.6	1.91	83.2	84.0	84.2	1.70
Houston	92.2	94.9	94.8	2.60	85.8	86.8	86.2	2.21
Indianapolis	90.6	91.3	92.2	2.63	84.3	84.1	84.3	2.66
Jacksonville	92.1	94.2	94.4	2.22	86.3	86.6	88.0	2.33
Kansas City	90.0	91.6	91.9	2.16	83.5	83.6	84.4	2.03
Little Rock	92.0	95.2	94.5	2.37	85.2	86.5	85.6	2.02
Los Angeles	91.0	91.9	92.7	2.50	82.6	83.2	83.9	2.10
Louisville	91.8	83.6	93.9	2.78	85.5	85.8	86.6	2.73
Memphis	91.5	94.2	94.3	2.49	84.6	85.4	86.1	2.62
Milwaukee	93.5	93.7	93.9	2.52	84.4	84.3	84.4	2.30
Minneapolis	89.9	91.4	92.2	2.56	83.7	84.1	84.6	2.41
Montreal	91.1	92.4	92.5	2.31	87.3	86.8	87.9	1.81
Nashville	91.8	94.3	94.8	2.69	84.8	85.9	86.4	2.36
New Orleans	92.3	94.4	94.4	2.68	85.4	86.3	86.6	2.57
New York (Met. area)	92.4	93.9	94.0	2.73	87.6	88.2	88.7	2.60
Omaha	89.7	90.9	92.0	2.43	83.1	83.4	84.3	2.29
Philadelphia	92.7	94.2	94.5	2.45	87.7	88.2	89.4	2.57
Pittsburgh	92.3	94.3	94.3	2.46	87.6	88.3	88.9	2.61
St. Louis	90.0	91.6	92.0	2.56	83.3	83.8	84.0	2.60
Salt Lake City	88.5	89.0	89.6	1.93	80.3	81.6	81.3	1.85
San Francisco	90.9	91.9	92.9	2.78	82.2	83.1	84.2	2.32
Seattle	90.6	92.0	92.0	2.73	82.1	83.6	83.5	2.24
Shreveport	91.9	94.6	94.6	2.68	84.6	86.0	85.0	2.55
Spokane	90.3	91.5	92.2	2.36	82.2	83.2	84.4	1.74
Toronto	91.0	92.1	92.6	2.14	86.6	86.7	88.2	1.74
Tulsa	90.5	92.0	92.2	2.45	83.2	83.3	84.5	1.73
Vancouver	90.3	91.0	90.9	2.80	82.6	84.4	83.7	2.51
Wichita	90.6	90.3	91.2	2.44	83.1	83.1	84.1	1.23
Winnipeg	90.1	91.3	92.0	1.27	84.8	84.9	85.6	1.31

on the latest survey. The lowest premium was reported for Salt Lake City with an average of 89.6. This average was only 0.2 octane number higher than the average for regular gasoline in Philadelphia.

The other small table shows unweighted averages for both premium and regular grades by PAW districts. Premium gasoline in the eight cities in District 1 had an average of 94.4, up 0.2 from the April survey. Regular gasoline moved up 0.8 for the same cities. The average for regular gasoline was down slightly in District 3 on the July survey.



Catformer's Tail Gas Supplies . . .

. . . New Ammonia Plant

George H. Weber

PHILADELPHIA. — The first synthetic anhydrous ammonia plant charging catalytic reformer tail gas is now in routine operation at The Atlantic Refining Co.'s major refinery here.

The 100-ton per day unit is the third major project to be completed in Atlantic's current $50 million expansion and modernization program at the Point Breeze refinery.

Since it utilizes the hydrogen produced from naphtha reforming, the new plant is unique in the design of its hydrogen purification facilities. The principal impurities are light hydrocarbons and hydrogen sulfide, which are removed in stages as the temperature of the mixture is reduced.

Atlantic's new operation also enjoys a marketing advantage, located in the heart of the heavily industrialized Middle Atlantic Seaboard. It is the only East Coast plant north of Virginia, and the nearest source of ammonia to the west is a small plant in Niagara Falls. About 60 per cent of production will go to chemical manufacturers for industrial use. The remainder will be marketed to agricultural consumers.

Source of the hydrogen is the company's 11,100-bbl. per day Catforming unit which went on stream late last year. Effluent gas comprising about 90 to 95 per cent hydrogen moves to the ammonia plant at 400 psig. The impurities comprise mainly methane, ethane, propane, butane, water vapor, and hydrogen sulfide.

Processing steps . . . A caustic scrubber and water wash first removes the sulfur, after which the gas is refrigerated in stages to condense out the water, and to liquefy and remove the hydrocarbons, one by one. The final step, removal of methane, takes place by washing the hydrogen stream with liquid nitrogen at about —300° F. Hydrogen of final purity for conversion contains only a trace of methane.

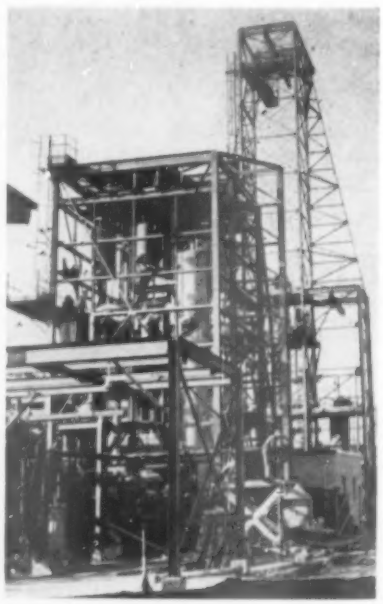
Incoming air is filtered, compressed to 85 psig., and charged to reversing exchangers which chill the gas mixture and freeze out water and carbon dioxide. The system is purged automatically by reversing the flow of gas every 7½ minutes. The remaining mixture of nitrogen, oxygen, and other gases is then chilled by stages to —300° F. to obtain pure nitrogen.

The cooling of both the hydrogen and nitrogen mixtures takes place in a vertical structure which supports a number of exchangers, chillers, and other low-temperature equipment. After installation of all equipment, the rectangular structure was completely sheathed and all remaining air space inside was filled with rock wool insulation. The unit is known as the "cold box" by operators.

Feed-gas compression . . . Pure nitrogen and hydrogen are combined in the proper ratio and compressed in two stages to the desired reaction pressure. Discharge from the first stage at 1,250 psig. passes a copper-nickel catalyst bed in the deoxidizer to remove the last trace of oxygen as a final precaution against catalyst poisoning.

The final pressure may vary from 2,200 to 3,850 psig., depending on the level of catalyst activity and other conversion conditions. After passing an oil separator to remove any trace of compressor oil which may have been entrained with the charge, the nitrogen-hydrogen mixture is charged to the reactor. The synthesis of ammonia takes place at 900° to 1,000° F. as the two elements pass through a fixed bed containing 26,000 lb. of a special catalyst.

About 20 per cent conversion per pass is normal, hence a high recycle



THIS REACTOR SECTION at Atlantic's Philadelphia refinery makes the first use of catalytic reformer hydrogen for conversion to synthetic anhydrous ammonia. Purified hydrogen and nitrogen are combined at high pressure and temperature.

ratio of unreacted gases is maintained. Converter effluent is quenched and chilled for removal of combined ammonia in liquid form.

The product is then staged to lower pressure through a letdown drum and is moved to storage in two spherical tanks which hold 15 days' production. Storage is held at 30 to 40 psig. and a temperature of 25° F. is maintained by continuous removal of vaporized ammonia which is recompressed and recycled as a cooled liquid.

Other firms' plans . . . The new Atlantic unit was designed and built by Hydrocarbon Research, Inc. It is the first to be designed expressly for catalytic reformer hydrogen. Other units are now planned or under way. Shell Chemical Corp. is presently expanding ammonia capacity at the Pittsburg, Calif., plant to take on added hydrogen in the form of tail gas from a new reformer recently put on stream at Shell Oil Co.'s nearby Martinez refinery.

In Sarnia, Ontario, Dow Chemical Co. of Canada is also expanding ammonia facilities and it is understood will utilize hydrogen-rich reformer gas available locally.

In the Philadelphia area, Sun Oil Co. is considering the construction of an ammonia unit which will utilize the hydrogen from its existing catalytic reformer and a second unit recently contracted. This unit would be capable of producing about 300 tons per day.

Much of the hydrogen available from catalytic reformers throughout the country is produced in quantities too small to justify ammonia synthesis operations. Some of the hydrogen will be utilized internally in mild hydrogenation operations, but the growing supply is considered an important potential source of hydrogen for future ammonia markets.

Atlantic's new plant is a forerunner of a trend which may represent substantial nitrogen resources in this country.

Merger Attempt Abandoned

HOUSTON. — American Republics Corp. and Tennessee Production Co. have abandoned their year-old attempt to merge.

A statement issued by T. Rieber, chairman of the board of American and Gardiner Symonds, chairman of the board of Tennessee, gave no reason for the abandonment. However, failure of the two companies to agree on engineering estimates of Tennessee's reserves of oil and gas is thought to have been a prominent factor.

It was also rumored that Tennessee Production might be merged with Tennessee Gas Transmission Co., which at one time owned 99 per cent of Tennessee Production but which now, following a public offering of the stock, owns less than 50 per cent.

Badger Work Starts

November completion set for 195-mile products line

EAST CHICAGO, Ind.—First construction on the 195-mile, $15,000,000 Badger products line from here to Madison, Wis., has started.

Morrison Construction Co., Hammond, Ind., has been awarded the contract to build 39.9 miles of line. This section runs westward from East Chicago to a point near the Lemont pump station, then swings northeast along Chicago's sanitary canal to Harlem Avenue in Chicago. Several products terminals will be served at Harlem Avenue.

Contract for the remainder of the line is expected to be let soon since the system is scheduled to be in operation by November 15. Pipe laying is expected to require a minimum of time since the pipe already has been Somastic coated and is ready to go into the ground.

The line is being constructed under the name of Badger Pipe Line Co. Cities Service Oil Co., Sinclair Pipe Line Co., Pure Oil Co., and The Texas Co. will own the line. Cities Service is the agent for construction and operation.

The line will have a capacity of 65,000 bbl. daily. All pipe will be 12 in. in diameter other than a 17.75-mile, 10-in. section running from the Lemont pump station to Harlem Avenue.

The Morrison contract covers construction of 28.8 miles of 12-in. and 11.1 miles of 10-in. line. It also includes building the East Chicago pump station.

New Pipeline Due

Arapahoe ready to build Colorado-Kansas system

INDEPENDENCE, Kans.—The recently founded Arapahoe Pipe Line Co. is expected to let a contract this week for construction of a $25,000,000 crude line from the Denver-Julesburg basin to Humboldt, Kans.

Earl W. Unruh, who was elected president of the new firm last week, said pipe orders for the 494-mile line have been placed and deliveries are expected to start in about a week.

Unruh for years has been associated with Sinclair Pipe Line Co., coowner with Pure Oil Co. of the new crude carrier. He was part-interest executive for Sinclair prior to his election as head of Arapahoe.

Other Sinclair personnel from the Independence headquarters named officers of Arapahoe include C. E. Dickey, superintendent of stocks and materials, and J. D. McConnell, general manager of crude lines. Dickey is a vice president and director of the new company and McConnell is a director.

Joseph W. Meehan, of Chicago, president of Pure Transportation Co., was named vice president and director of Arapahoe. Directors also include two other Pure Oil executives, Victor H. Bowman and Allen C. Hutcheson, both of Chicago.

Announcement of Arapahoe's organization spiked rumors that one or more other oil companies might be dealt into the new firm.

To join trunk line . . . The new crude system will extend from Merino, Colo., southeast through Colorado and Kansas to Humboldt, where it will tie in with Sinclair's "big inch" line carrying crude to refineries in the Chicago area. The system will have an initial capacity of 80,000 bbl. daily, including 30,000 bbl. of Kansas crude.

The 319-mile section from Merino to Great Bend, Kans., will be of 18-in. pipe. The remaining 175-mile section will be of 20-in pipe.

More than half the route of the new pipeline has been surveyed and about one-third of the right-of-way has been acquired.

Initial plans call for only one pump station at Merino, since the system will have a gravity fall of about 3,500 ft.

Karl T. Feldman, head of Sinclair's engineering department at Independence, was named manager of the new company's construction office at Hutchinson, Kans.

Canadian Line Begun

Fulton-Banister begins work on 155-mile leg of 900-mile crude system stretching from Fosterton field to St. Paul

EDMONTON.—Construction has started on the last leg of a 900-mile pipeline system that will move Canadian crude to Great Northern Oil Co.'s refinery under construction at St. Paul.

This last link is the South Saskatchewan pipeline, which runs from Fosterton field in Southwest Saskatchewan to Regina. Fulton-Banister, Ltd., Edmonton, has been awarded contract for the 155-mile, 16-in. line.

Oil flowing from Fosterton will move into the Interprovincial pipeline at Regina, then will move across the Canada-United States border to Clearbrook, Minn., where it will enter the Minnesota pipeline, also in the early construction state *(The Oil and Gas Journal, July 12, page 71)*.

The South Saskatchewan line, which will have a capacity of 20,000 bbl. daily, will cost an estimated $10,000,000. Construction has been set for 90 days, with completion slated in late October.

The Minnesota line is scheduled for completion next July. Completion of this line will finish the system since Interprovincial already is completed.

Refinery plans . . . Great Northern's 25,000-bbl. refinery will be completed shortly after the scheduled completion of the pipeline system.

Great Northern has a 10-year commitment for Fosterton crude. Socony-Vacuum Exploration Co., a subsidiary of Socony-Vacuum Oil Co., will supply 50 per cent of the crude; Woodley Canadian Oil Co., a subsidiary of Woodley Petroleum Co., will supply 30 per cent; and Southern Production Co., Inc., will supply 20 per cent.

The three producing companies or their parent companies own the South Saskatchewan line. The ownership is divided with Socony-Vacuum holding 50 per cent, Woodley 30 per cent, and Southern Production 20 per cent.

Two of the producers also are co-owners of a majority of Minnesota pipeline. Woodley and Southern Production both own 40 per cent of the line. The remaining 20 per cent is owned by J. Howard Marshall, vice president of Signal Oil & Gas Co., Fort Worth.

New firm formed . . . The Fulton-Banister company is a recently formed partnership between Banister Construction Co., Edmonton, and R. H. Fulton, Lubbock, Tex.

The Banister firm also has a subcontract to build the gathering system in the Fosterton-Success-Centuar fields and is under contract to Interprovincial for one of the spreads in the looping program under way between Edmonton and Superior, Wis.

Industry Briefs

BILLINGS, Mont.—Northern Natural Gas Producing Co. will drill three wells on land leased from Northern Pacific Railway Co. in the Big Coulee-Hailstone area in Golden Valley and Stillwater counties, Montana. Phillips Petroleum Co. has leased land from Northern Pacific in the North Porcupine area of Rosebud County, Montana. The agreement provides Phillips may drill two to four wells on the land.

NEW ORLEANS.—Sidney M. Groom, Jr., attorney-adviser in the Bureau of Land Management, Washington, has been named to direct the bureau's work in connection with the outer Continental Shelf. He is working from the Department of Interior office here. Groom, holder of a LL.B. degree and B.S. degree in physics from the University of Oklahoma, entered Government service in 1953.

BATON ROUGE.—Allowable Louisiana crude-oil production for August has been set at 612,690 bbl., a cut of 27,228 bbl. daily from the July allowable. The allowable is the lowest since the 611,993 bbl. allowable of October 1950. The allowable by districts is: Houma, 139,505 bbl.; Lafayette, 138,196 bbl.; Lake Charles, 59,813 bbl.; New Orleans, 165,881 bbl.; Monroe, 51,075 bbl.; and Shreveport, 58,220 bbl.

BATON ROUGE.—The state mineral board will offer about 20,000 acres in 27 tracts for lease August 18 and about 22,800 acres in 7 tracts for lease September 15. Most of the land in the first leasing is located inland. All the land in the second leasing is offshore.

TULSA.—Aurora Oil Co., Tulsa, and Sarita Oil Co., Dalias, have acquired producing interests in 17 tracts in Caddo County, Oklahoma, from Plains Petroleum Properties, Inc.

LONG BEACH.—Richfield Oil Corp. is seeking a 40-year lease from the city of Long Beach on 16 acres of harbor property so that its two marine terminals in Channel 2 and Channel 3 can be consolidated. Acquisition of the property would enable the company to berth three large tankers at one time, instead of only two under present conditions. The Board of Harbor Commissioners has indicated its approval and work is expected to begin in about 2 months.

FORT WORTH.—Members of the Texas Railroad Commission and royalty and working interest holders have been invited to attend ceremonies August 3 inaugurating a water-flood program in Manning-Harrington Strawn field of Throckmorton County, North Central Texas. Woodson Oil Co., Fort Worth, is operator of the 800-acre, 45-well project. Woodson held all but two leases in the field, those of E. R. Perkins, Olney.

AUSTIN.—The Texas Railroad Commission has notified operators in the state that it no longer requires that they file a form for permission to shoot or acidize a well or the formerly required statement of well condition after such treatment.

After Years of Flat Price Boosts . . .

. . . Poor Crudes Face Adjustment

John C. Casper

THE recent price cut for Oklahoma sour crude emphasizes one fact: Every crude-price increase since the war has increased the premium paid by refiners for heavy crude.

"Across the board" price hikes sent the price of light crude up by roughly 130 per cent, but heavy-crude prices soared nearly 200 per cent. Too, these increases came during a period when residual fuel, the primary product from heavy crude, was losing some of its important markets.

This fact, together with soft product markets, has tended to reduce purchases of the less-desirable crudes, and the Oklahoma sour-crude price cut is a typical example.

What has happened . . . The accompanying table showing price changes since the war illustrates how heavy crude has cut into the percentage spread between it and the lighter crude.

Note that light crude, 40° and above, moved up from $1.25 during the war to $2.90 after the last price increase on June 15, 1953. The seven price increases in this period resulted in a net increase of $1.65 per barrel, or 132 per cent, for 40°-gravity crude.

On the other hand, the same increase of $1.65 for 20°-gravity crude represented a gain of 194 per cent.

During the war when 40°-gravity was selling for $1.25 and 20°-gravity brought $.85, the price of the low-gravity crude was 68 per cent of the price quoted for the high-gravity oil. After the $.10 increase allowed by OPA on April 1, 1946, the heavy crude was bringing 70 per cent of the top price.

These changes in percentage relationship of the two crudes are shown in the small table. Note that after the last price raise in June 1953 20°-gravity crude had continued to gain on light crude until it was bringing 86 per cent of the top price.

In the large table a theoretical gravity schedule has been added as next to the last column. This schedule was constructed with the same gravity differential throughout the schedule, but increased enough above 2 cents to produce about the same percentage increase over wartime prices for both light and heavy crude. This schedule shows that it would take a change of about 5 cents per degree of gravity to give the same percentage increase for both light and heavy crudes.

Effect on buying . . . These changes in the relative prices paid for light and heavy crudes have tended to reduce purchases of the less desirable crudes. A typical example has been the sour crudes of southern Oklahoma.

The fact that it was almost impossible to sell these crudes for many months was a definite indication that refiners knew that it was not profitable to refine them.

Most refiners run tests on all crudes purchased in order to evaluate them on a basis of the sale value of the products made. Unprofitable crudes are listed for replacement as soon as contract commitments and availability of better crude permit.

Economics involved . . . Several crude purchasers and refiners were checked for typical refinery yields from various crudes. The following is a comparison of 29°-gravity southern Oklahoma sour with West Texas 33°-gravity sour.

. . . For southern Oklahoma crude the yields were: gasoline 42.0 per cent, kerosine 8.3 per cent, No. 2 fuel 16.4 per cent, and residual and other 33.3 per cent. The last item includes any products used as refinery fuel as well as refinery gas.

If these products are evaluated, using the latest Group 3 spot prices from The Journal, the total realization from a barrel of this crude is about $3.14.

In this calculation all gasoline is credited at the average price for regular gasoline. Kerosine and No. 2 fuels are taken at the average of the high and low of spot quotations. All residual and other is valued at the average price for No. 6 fuel.

. . . For West Texas crude, the yields were: gasoline 50.8 per cent, No. 2 fuel 24.6 per cent, and residual and other 24.6 per cent. No kerosine was made because of the sulfur content. Using the same spot prices as above, the value of products from the West Texas crude amounts to $3.40.

The products from a barrel of West Texas crude bring $.26 more than products from a barrel of southern Oklahoma sour. West Texas sour crude, 33°-gravity, is worth $2.63 at the well.

POSTWAR CHANGES

(Oklahoma-Kansas)

Date of change—	Price after change 40°	Price after change 20°-20.9°	Per cent ratio 20° to 40°
Wartime ceiling	$1.25	$ .85	68
4- 1-46	1.35	.95	70
7-25-46	1.60	1.20	75
11-25-46	1.70	1.30	76
3-10-47	1.95	1.55	79
10-15-47	2.15	1.75	81
12- 6-47	2.65	2.25	85
6-15-53	2.90	2.50	86

Trends in Crude Oil Prices

(Oklahoma-Kansas, in dollars per barrel)

Gravity (Degrees)	Current postings	Wartime ceiling	Per cent increase	Schedule (Five cent differential)	Per cent increase
40 and up	$2.90	$1.25	132	$3.02	142
39-39.9	2.88	1.23		2.97	
38-38.9	2.86	1.21		2.92	
37-37.9	2.84	1.19		2.87	
36-36.9	2.82	1.17	141	2.82	141
35-35.9	2.80	1.15		2.77	
34-34.9	2.78	1.13		2.72	
33-33.9	2.76	1.11		2.67	
32-32.9	2.74	1.09		2.62	
31-31.9	2.72	1.07	154	2.57	140
30-30.9	2.70	1.05		2.52	
29-29.9	2.68	1.03		2.47	
28-28.9	2.66	1.01		2.42	
27-27.9	2.64	0.99		2.37	
26-26.9	2.62	0.97	170	2.32	139
25-25.9	2.60	0.95		2.27	
24-24.9	2.58	0.93		2.22	
23-23.9	2.56	0.91		2.17	
22-22.9	2.54	0.89		2.12	
21-21.9	2.52	0.87		2.07	
20-20.9	2.50	0.85	194	2.02	138

Before the latest adjustment, the southern Oklahoma crude brought $2.68 and is posted at $2.47 on the new schedule.

Oklahoma still high . . . Even on the new schedule, the Oklahoma crude posting is only $.16 under West Texas while the product value differential at the refinery is $.26.

Under the old posting, the Oklahoma crude could not compete in the Chicago area with either West Texas or Wyoming if all crudes started out at the wells at posted prices.

The new posting for southern Oklahoma is reported to be competitive with Wyoming crude in the Chicago area.

Ben Franklin Refining Co. initiated the price change with a reduction of 13 cents per barrel for the entire gravity schedule, effective July 3.

Rock Island Oil & Refining Co., Inc. posted the new schedule with a top of $2.80 for 40°-gravity and a differential of 3 cents for each degree change in gravity, effective July 23. Ben Franklin has since announced that it will meet the Rock Island posting.

The accompanying gravity schedules compare the new southern Oklahoma schedule with the variable differential posting for Wyoming sour, and with postings for Wilmington field in California.

GRAVITY SCHEDULES

Gravity	So. Okla.	Wyoming sour	Wilmington Calif.
40 and above	$2.80	$2.72	
39-39.9	2.77	2.70	
38-38.9	2.74	2.68	
37-37.9	2.71	2.66	
36-36.9	2.68	2.64	
35-35.9	2.65	2.60	
34-34.9	2.62	2.56	
33-33.9	2.59	2.52	
32-32.9	2.56	2.48	
31-31.9	2.53	2.44	$3.07
30-30.9	2.50	2.39	3.01
29-29.9	2.47	2.34	2.95
28-28.9	2.44	2.29	2.89
27-27.9	2.41	2.24	2.82
26-26.9	2.38	2.19	2.76
25-25.9	2.35	2.13	2.69
24-24.9	2.32	2.07	2.62
23-23.9	2.29	2.01	2.55
22-22.9	2.26	1.95	2.48
21-21.9	2.23	1.89	2.41
20-20.9	2.20	1.83	2.34
19-19.9	2.17	1.77	2.29
18-18.9	2.14	1.71	2.23
17-17.9	2.11	1.65	2.17
16-16.9	2.08	1.59	2.10
15-15.9	2.05	1.53	2.04
14-14.9	2.02		1.98

ROCKY MOUNTAIN

Wyco Signs Frontier

Cheyenne refinery to ship through line to Denver

DENVER.—Frontier Refining Co. and Wyco Pipeline Co. last week signed an agreement providing for Frontier's use of the Wyco products line extending from Casper, Wyo., via Cheyenne to Denver.

The Frontier connection is being made 5 miles west of Cheyenne, where Frontier operates a 15,000-bbl. modern refinery. Deliveries to the Wyco line will start about October 1.

The Wyco line was built several years ago by Standard Oil Co. (Ind.), Socony-Vacuum Oil Co., Inc., and The Texas Co. and delivers 13 products from the companies' three Casper refineries, which have a combined crude capacity of 35,000 bbl. daily.

The 8-in. line has terminals at Cheyenne and Denver and a present rated capacity of 25,000 bbl. daily.

Wyoming-Nebraska . . . The new connection will be part of the facilities of the newly organized Wyoming-Nebraska Pipeline Co., a Frontier subsidiary. The new firm is now building a 6-in. products line from Cheyenne to North Platte, Neb., with a connection at Sidney. Capacity will be 8,000-bbl. daily to Sidney and 6,000 bbl. on to North Platte.

While no announcement has been made, it is assumed that one or more companies will eventually use the Wyoming-Nebraska facilities through the Wyco connection. Exchange arrangements involving other Rocky Mountain refiners can also be made.

The Wyoming-Nebraska line is now being laid at a rate of 3 miles a day by Houston Contracting Co. H. B. Dellaplain, formerly with Great Lakes Pipe Line Co., has been named superintendent of the new line.

Gas-Line Expansion Asked

OMAHA, Neb. — Northern Natural Gas Co. is seeking federal approval to build about 330 miles of natural-gas pipeline to 20 communities in South Dakota.

The $6,661,100 program would include extending Northern Natural's main line from near Sioux Falls to Aberdeen. The company would also lay 164½ miles of branch lines to the towns.

The main line extension would include 94.1 miles of 12¾-in. pipe and 70.9 miles of 10¾-in. pipe. The branch lines would vary from 2 to 8 in.

Tensleep Discovery

Big Polecat well running casing in 100 ft. of pay

DEAVER, Wyo.—An apparent Tensleep discovery in the Big Polecat unit of Park County promises to be of great importance to Wyoming's northern Big Horn basin area.

Mule Creek Oil Co. 1 Unit, located on basis of seismic data, found more than 100 ft. of Tensleep saturation and is running casing.

The Big Polecat area is surrounded by Tensleep production in older Elk Basin, South Elk Basin, Garland and Frannie fields. These fields are toward the flanks of the Big Horn basin. Continental Oil Co. drilled a deep Tensleep test at North Danker, finding some Tensleep showings, but of noncommercial value.

This is Mule Creek Oil Co.'s first deep test. A second location has been staked on the unit as a result of the good Tensleep indications at 1 Unit. The company has previously drilled gas wells on the Big Polecat structure.

Hearing Postponed

Northern Natural pipeline case reset for October 5

BISMARCK. — The Public Service Commission has postponed until October 5 its hearing on Northern Natural Gas Co.'s application for permit to construct a pipeline from Tioga to Fargo, N. D.

The hearing was reset from August 2 at request of the company.

Northern Natural told the commission it has not completed negotiations for natural gas for its proposed 24-in. line from Tioga to Fargo, which also would be a segment of its proposed line to bring Alberta gas to Minneapolis-St. Paul. In the application filed June 22, Northern Natural said it proposed to buy natural gas in the Tioga area

"or elsewhere in the Williston basin" as well as Canadian gas.

Rival seeks storage . . . Meanwhile, North Dakota Natural Gas Transmission Co. issued a statement at St. Paul saying the company was negotiating with Montana-Dakota Utilities Co. to use M.D.U.'s underground storage in eastern Montana and that it would apply for a rehearing on its application for a Tioga to Fargo and Grand Forks pipeline.

N. D. Natural expressed "amazement" at the commission's July 21 order denying an application for rehearing to modify five conditions set for certification, saying that substantial progress had been made in meeting the conditions. N. D. Natural's original plan had no provision for storage.

The commission dismissed N. D. Natural's application without prejudice, leaving the way open for an appeal for rehearing.

Spacing Ordered

State commission delays decision on Tioga field

BISMARCK, N. D.—The Industrial Commission set 80-acre spacing for 18 months on two North Dakota oil fields but delayed a decision on Tioga field.

Temporary spacing was set for McGregor Madison pool, 4 miles northwest of Tioga and for East Tioga, 3 miles east of Tioga. A decision was delayed on Tioga where Amerada Petroleum Corp. also sought an 80-acre pattern.

The commission had ordered the hearing to set proper spacing for Tioga and East Tioga and temporary spacing for McGregor. Landowners, organized to seek 40-acre spacing, contended proper spacing was synonomous with permanent and sought a 60-day delay to hire a petroleum engineer for their case.

Objections were withdrawn when Amerada asked the commission only for temporary spacing in East Tioga where there are only four producing wells, and told the commission it was agreeable to any term the commission placed on its Tioga order. Landowners asked the commission for a 1-year, 80-acre order.

Tioga drew interest . . . The chief interest was in Tioga field, first North Dakota pool to have extensive data available for a spacing hearing.

Henry Keplinger of Keplinger and Wanenmacher, Tulsa consulting engineering firm, was chief witness for Amerada which has more than 80 per cent of the acreage at Tioga.

Keplinger suggested an outline embracing 20,960 acres for the Tioga field and said evidence indicates it will be separate from nearby East Tioga and Beaver Lodge fields. All produce from the Madison lime, but Devonian and Silurian production have also been found in Beaver Lodge.

Original pressure of the Tioga Madison pool was 3,650 psi. when Amerada's 1 H. O. Bakken discovery was completed early in 1952, Keplinger said. With 133 wells drilled and a cumulative production of 3,123,224 bbl. to May 1, the reservoir pressure has dropped to 3,280 psi.

Continuous reservoir . . . Keplinger presented a mass of logs and twice-yearly bottom-hole pressure and gas-oil ratio tests which he said indicate a continuous and interconnected oil reservoir with no evidence of conditions which would isolate one portion of the reservoir from any other. He said pressure data shows intercommunication between wells throughout the complete length of the field and gas-oil ratios have remained equal for both old and new wells.

He estimated the optimum producing rate for Tioga pool at about 10,000 bbl. daily without pressure maintenance by water flood and said wells spaced on 80 acres would recover as much oil per acre as 40-acre spacing.

Lease Bids Total $285,308

BISMARCK, N. D.—Three oil and gas auction sales brought $285,308 for 51,633 acres last week.

Chief interest was in bidding for Missouri River bed acreage, first offered in the state, but bids were unexpectedly low. T. N. Jordan, Bismarck broker representing an unidentified client, acquired the 1,074-acre Range 95 between Hofflund field in Williams County and Charlson field in McKenzie County. Jordan's bid was $14 per acre.

Bonuses and first-year rentals on 13,455 acres totaled $62,108. The average bonus exclusive of the river-bed land was $3.57 per acre on 10,982 acres in 15 counties.

The Board of University and School Lands received $114,319 for 34,160 acres in 15 counties. The average bonus per acre was $3.06.

Best prices were paid at an Indian Agency sale of 15,668 acres in the Fort Bethold Reservation. The average bid was $27.09 per acre, with bonuses totaling $108,881. Stanolind Oil & Gas Co. paid the peak price of $78.10 per acre on six tracts totaling 640 acres in McLean County.

Option Considered

El Paso Natural ponders Colorado-Western purchase

EL PASO, Tex.—El Paso Natural Gas Co. will decide within the next 2 weeks whether to exercise its option to purchase two-thirds of the stock of Colorado-Western Pipe Line Co.

El Paso attorneys are studying the certificate granted Colorado-Western by the Public Utilities Commission of Colorado to build a natural-gas pipeline from Ignacio in southwestern Colorado to Denver via Pueblo and Colorado Springs.

C. L. Perkins, vice president and general manager of El Paso Natural, said last week the certificate appears to be in good order except for a few minor points involving wording which would have to be ironed out with the commission.

If El Paso exercises its option, Perkins said, the company would take over active management of Colorado Western and build and operate the pipeline.

The projected $21,000,000 328-mile line would carry about 100,000,000 cu. ft. of gas daily from the San Juan basin. Plans for construction of this line were laid before the Public Utilities Commission in February. About a month before submitting this application, Colorado-Western applied for permission to lay a 454-mile, $33,000,000 gas system to originate in the same general area and serve a large number of small Colorado communities. Easternmost towns along this system would have been Canon City and Florence, the latter about 25 miles northwest of Pueblo.

It is believed Colorado-Western has abandoned plans to build this system—although hearings on the project are still scheduled on the Public Utilities Commission docket for September 7.

Wyoming Wildcat Hits

DENVER.—Forest Oil Co. recovered 36°-gravity oil at the rate of 1,440 bbl. per day during the 80-minute flowing time of a 2-hour drill-stem test at 1 Morton 22-1 in the Grieve Unit, Natrona County, Wyoming.

Production is from 6,743-68 ft. in a Cretaceous sand. The operator is preparing to core ahead after having cored 36 ft. of saturated sand.

The discovery is 10 miles southwest of West Poison Spider which produces from the Mesaverde and Frontier, and is 6 miles northwest of a small Lakota gas discovery made by Atlantic Refining Co. in the Fish Creek unit.

Plant Nears Completion

Northwest's first major refinery may use Venezuela crude although it will be connected with big Canadian pipeline

SEATTLE.—General Petroleum Corp.'s new refinery at Ferndale, Wash.—first major refinery in the Pacific Northwest—is nearing completion and will start operation early in October.

Although the 35,000-bbl. plant will be connected with a spur line from Trans Mountain Pipeline's big Edmonton-Vancouver crude carrier, it may acquire its crude supply from Venezuela.

Because of the crude-market situation and tanker rates, Alberta crude may be unable to compete with Venezuelan oil. Low tanker rates favor Venezuelan crude by as much as 25 cents per barrel or more and General Petroleum may see fit to buy the cheaper material.

Trans Mountain Oil Pipe Line Co.'s big pipeline from the Edmonton area may not approach its 150,000-bbl. per day rated capacity until next July. By that time Shell Oil Co. will be completing its 50,000-bbl. refinery at nearby Anacortes. By meeting the needs of the Shell refinery, together with the Vancouver refinery market of about 50,000 bbl. daily, the line even then would be operating at only two-thirds capacity.

Two units of the General Petroleum refinery are to be put on stream in October and plans call for a 25,000-bbl. daily output of refined products by Thanksgiving. Later throughput will be increased to the 35,000-bbl. rated capacity.

Price dilemma . . . Announced intent of the company is to start the plant in operation with Canadian crude, brought to the refinery through a spur line from the Trans Mountain main carrier takeoff at Sumas, B. C. Tanker rates and crude prices may determine what crude is used after that.

Current price of 34°-gravity Redwater crude delivered at the plant site is approximately $3.60 per barrel, including import duty. Price of eastern Venezuelan crude of similar gravity and characteristics is in the $3.30-$3.50 range. The $3.30 price is based on transportation cost of USMC rate minus 60 per cent and the $3.50 price at minus 40 per cent. Thus, at rates at which some tankers are being chartered, Redwater crudes are at a disadvantage.

The number of big, fast tankers being built rules out probability of any important change in the situation during the near future.

Supply-demand situation . . . Until the General Petroleum and Shell refineries are put into operation, bulk of the Pacific Northwest market will continue to be supplied from California refineries. Total current demand is about 270,000 bbl. daily in Oregon, eastern Washington, northern Idaho, and lower British Columbia. Local plants supply only about 50,000 bbl. of products daily.

Aside from small quantities of aviation gasoline blending stocks and residual oils shipped in from California refineries, or brought westward by rail, local Vancouver-Victoria demand is being met by three refineries. They currently have a combined throughput of 45,000 bbl. daily and soon will have almost 50,000-bbl. capacity.

All of the plants are located on Burrard Inlet, terminus of the Trans Mountain line, in the Vancouver area. Largest is the 22,500-bbl. Ioco plant of Imperial Oil, Ltd. It, like the 15,000-bbl. Shellburn plant of Shell Oil Co. of Canada, Ltd., was practically doubled in capacity when Alberta crudes became available by pipeline. Standard Oil Co. of British Columbia is operating an 8,000-bbl. plant at North Burnaby but these facilities will be shut down when a new 11,000-bbl. plant is completed about November 1.

To supply these refineries and the 5,000-bbl. plant of Royalite Products, Ltd., at Kamloops, 200 miles northeast, Trans Mountain during the first half of 1954 operated at approximately 35,000 bbl. daily. This was accomplished through keeping two pump stations closed down and operating the other two part time. The average is expected to be boosted to about 42,000 bbl. daily during the third quarter and during the last 3 months may run higher.

Smog Laid to Cars

Scientist says exhaust worse than refinery gas

LOS ANGELES.—The family automobile is becoming an increasingly important factor in this area's smog problem, a group of European scientists was told here.

Dr. A. J. Hagen-Smit of the California Institute of Technology told the visiting scientists that the growing number of automobiles in this region can be blamed for the increase in air pollution in recent years.

The Europeans, here for first-hand information about the Los Angeles smog situation, were told that in 1950 automobile exhaust gases were rated about even with oil-refinery vapors as air pollutants. Automobiles and refineries then accounted for about 800 tons of pollutants daily, Hagen-Smit said.

Because of recent control measures

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placed in effect by the oil industry, refineries now are blamed for only about 300 tons daily. However, Hagen-Smit said, the smog level remains about the same because the increasing population has brought many more cars into the area.

Nine test stations were set up at various points in the Los Angeles basin during late July so the smog concentration pattern could be accurately studied.

Devices developed by Hagen-Smit and Stanford Research Institute will measure the ozone content around the clock, using the ozone concentration of the atmosphere as an index of smog intensity. Tests for nitrogen oxides, hydrocarbons, and other air pollutants also will be conducted at the stations.

Seattle Signs for First Gas

SEATTLE.—A contract to bring the first natural gas to the Pacific Northwest was signed here last week.

Seattle Gas Co. signed the $100,000,000, 20-year agreement with Pacific Northwest Pipeline Corp., which will move the gas from the San Juan basin through a 1,466-mile pipeline *(The Oil and Gas Journal, June 28, page 84)*. Deliveries are expected to start by the end of 1955 or early 1956.

The Seattle utility has contracted for a maximum day's peak load of 40 million cubic feet of gas beginning the third year, plus 10 million cubic feet for industrial purposes.

The first 2-year period of the contract is covered by a "ratchet demand" provision that will permit Seattle Gas to build up its usage without having to take its contracted daily amount.

Expansion planned . . . The natural gas coming to Seattle Gas will replace manufactured gas currently distributed by the utility.

The utility has launched a $14 million, 5-year expansion program designed to convert the company to a natural-gas distributing organization. A major feeder and distribution system costing $150,000 has been started as the first step in the expansion.

N. Henry Gellert, Seattle Gas president, said the supply of gas contracted by his firm will be adequate to meet the demand of any industry in the area and any that "can conceivably come into our service area." Gellert predicted the advent of the natural gas will change present home building plans to where all future residences are constructed with natural-gas facilities.

Gellert and Robert R. Herring, Houston, Pacific Northwest vice president, signed the 20-year gas contract.

Pipeline status . . . Two Canadian companies seeking to build a line into the Pacific Northwest have asked the Federal Power Commission to review its approval of Pacific Northwest's plans. The FPC has until late August to consider the requests.

SIGNING THE CONTRACT that will bring the Pacific Northwest its first natural gas, N. Henry Gellert, president of Seattle Gas Co., gets the approval of Robert R. Herring, vice president of Pacific Northwest Pipeline Corp.

Pacific Northwest officials have declared they are going head with their plans to build the $160,000,000 line and plan to have it in service by late 1955.

State Shuns Suit

California won't enter tiff over Long Beach oil income

LONG BEACH—California apparently will not take part in legal moves to keep Long Beach from spending tideland oil income for upland civic improvements.

Governor Goodwin Knight says he won't make a move as governor to involve the state in a suit which the California Supreme Court will probably hear in September. Knight added, "neither will I recommend that the legislature" take any action to make the state a party to the dispute.

Knight's action was generally interpreted to mean California will make no effort to renege on its 1911 action giving Long Beach its tidelands out to the 3-mile limit to build a better harbor.

Legal attack . . . The lawsuit filed by Felix Mallon of Long Beach, attacks plans of the city to spend some $50,000,000 in oil income for upland civic projects. A superior court ruled in favor of the city and the Supreme Court recently agreed to hear the case.

The latest action in the dispute came early in July when the Tulare County Farm Bureau intervened as a "friend of the court" in an outright attack on the city's ownership of the tidelands. The Tulare County group contends when the legislature freed half the tidelands income in 1951, it failed to specify the money should go to the city of Long Beach. Before the legislative action the oil income could be spent only for harbor improvement, and the Tulare County action contends the money should go into the general fund for all Californians.

MID-CONTINENT

Kansas-Nebraska to Expand

PHILLIPSBURG, Kans. — Kansas-Nebraska Natural Gas Co. will add about 221 miles of pipeline and 2,700 hp. in compressor capacity to its natural-gas system in Nebraska in a $4,096,890 construction program.

The new line will range in size from 2 to 12 inches. The new compressor capacity will include a new 1,500-hp. station and boosting a present station 1,200 hp.

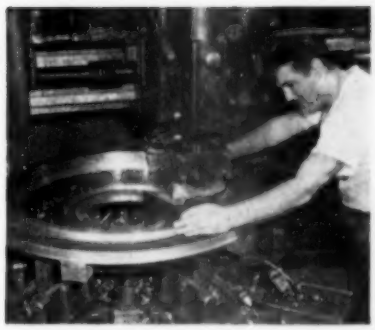
The proposed construction recently received federal approval.

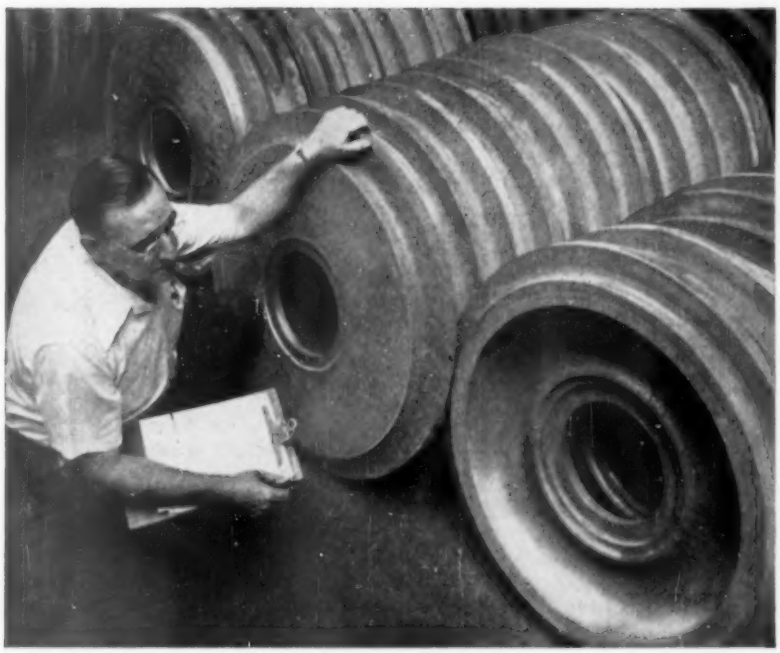
Utilities Propose Merger

TULSA.—The boards of directors of Oklahoma Natural Gas Co., Tulsa, and Consolidated Gas Utilities Corp., Oklahoma City, have approved a stock-exchange merger.

The new organization would be known as Oklahoma Natural Gas Co. and would headquarter in Tulsa. If the merger is completed, stockholders of Consolidated will receive 8/10th of a share of common stock in Oklahoma Natural for each share of common stock held in Consolidated. The agreement

THESE FORGED BLANKS *HELP REDUCE* MACHINING PROBLEMS





Checking a shipment of Bethlehem blanks at a plant of United States Rubber Company. Other photos show various stages in the machining of tire molds.

Steel with good grain flow, homogeneity, and uniform density can be machined with confidence. These characteristics are always present in Bethlehem's forged-and-rolled circular blanks, and they are one reason why this type of blank is so excellent for many applications.

Boiled down, reports from machine shops indicate the following:

When Bethlehem blanks are used, cutting speed is frequently higher, and fewer finishing cuts are required in many cases. Uniform finish allowance on OD, bore, and faces further contributes to speed and ease of machining. Moreover, the soundness of these blanks is an outstanding advantage.

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must be approved by two-thirds of the stockholders of each company. The boards agreed the merger must be completed on or before January 1, 1955.

Hugoton Scores First

TULSA. — The Oklahoma Panhandle's Hugoton field has reported its first Marmaton oil production.

Oceanic Oil Co. is drilling ahead at a geological wildcat, the 1-A Swinger, C NW NW 5-5n-16eCM, Texas County, after a drill-stem test at 5,366-88 ft. recovered 1,900 ft. of free oil, 180 ft. of heavily oil and water emulsion-cut mud in the Marmaton lime. Flow pressure was 840 psi. A 15-minute shut-in pressure was 1,380 psi. The well is scheduled to go to 7,500 ft.

CANADA

Trans-Canada Job Let

Three-company combine gets contract for engineering, management, and procurement on huge natural-gas line

DALLAS.—Trans-Canada Pipe Lines, Ltd., has let contract for engineering, management, and procurement for its projected huge natural-gas trunk line from Alberta to eastern Canada to a combine of Oklahoma Contracting Co., Canadian Bechtel, Ltd., and Mannix, Ltd.

Letting of the contract, revealed by Frank A. Schultz, vice president of Trans-Canada in Dallas, came as the Canadian Board of Transport Commissioners gave the firm the green light to proceed with financing and other necessary construction preliminaries.

The board had already tentatively approved the project *(The Oil and Gas Journal, July 5, page 90)* but withheld a permit pending receipt of further information from the company. The permit issued last week was conditional. It will be made final if Trans-Canada by the end of the year completes financing arrangements and gets a permit from the Federal Trade and Commerce Department to export gas to the United States.

Trans-Canada thus must dispose of almost $300,000,000 worth of securities within 5 months—one of the biggest, if not the biggest, financing jobs ever undertaken by a Canadian company. The operation will be directed by Lehman Brothers in a 50-50 arrangement with a Canadian banking group.

In the interval between now and December 31, Trans-Canada also will begin negotiating marketing contracts with public utilities and industrial concerns along the route of the line.

Largest ever . . . The 2,200-mile trunk, which will be the largest and longest ever laid, will extend from near Princess, Alta., near the Saskatchewan border, to Montreal, Que. A large lateral is planned from Winnipeg, Man., on the main line south to serve the St. Paul-Minneapolis area in the United States. The trunk would be 36-in. from the western terminus to Winnipeg and 30-in. on to eastern Canada.

The Transport Board approved the plan for the 30-in. section over some protests that it would not be large enough to take care of the ultimate market on the eastern terminus. The board reasoned that 30-in. lines were being used in the United States to take care of markets of similar size and that capacity could be boosted by looping and adding compressor stations.

The board also approved Trans-Canada's proposed northern Ontario route from the head of the lakes through Nipigon, Schreiber, Marathon, Hawk Junction, Chapleu, Sudbury, and North Bay to Toronto. It gave the company, however, the option to route the line farther north provided construction costs would not be out of line with anticipated markets.

Construction plan . . . Surveying operations along the route of the line have been under way for some time and should be completed in September or October, according to Schultz.

Actual construction work is scheduled to start next spring or early summer. Gas is slated to reach Winnipeg by late 1955, Toronto by late 1956, and Montreal shortly thereafter. The board specified January 1, 1957, as the deadline for completing all construction in its order granting the permit.

Branch line status . . . It was thought that Trans-Canada might encounter considerable difficulty in persuading the board to approve construction of the branch line from Winnipeg to the United States. This was due primarily to strong sentiment in the Canadian Parliament against permitting export of gas from Canada until Canadian markets now without it are supplied.

Under the permit issued the company by the Alberta government, the entire project was allocated 4.35 trillion cubic feet of gas over the next 27 years. This volume could be piped out of the province at a rate not exceeding 540,000,000 cu. ft. daily, with a maximum of 150,000,000 cu. ft. daily of the total allotted to the St. Paul-Minneapolis market.

Though the branch line passed one big hurdle in obtaining approval of the Transport Board, it still must be endorsed by the Trade and Commerce Department and the U. S. Federal Power Commission. The latter is thought in some quarters to have adopted a no-import policy as a result of its recent decision in favor of Pacific Northwest Pipe Line Co. over Westcoast Transmission Co. in the battle for the franchise to serve the Pacific Northwest.

Schultz predicted some time ago (before the Pacific Northwest-Westcoast Transmission decision) that the lateral stood a good chance of being built if Transport Board approval were obtained. He said then that he expected the branch would encounter little opposition rather than the usual from the coal bloc in hearings before FPC and that the commission would approve the plan in 6 to 8 months from the date of the application.

No route shift . . . Schultz squelched speculations that the route of the branch line might be moved to the west to deliver the gas at a point north of Tioga, N. D., instead of south of Winnipeg.

Northern Natural Gas Co., which would receive at the border the gas destined for the St. Paul area, told the North Dakota Public Service Commission recently that it was negotiating with Trans-Canada toward such a possibility *(The Oil and Gas Journal, June 28, page 85)*. This was revealed in the company's application to the state commission to build an $18,494,000, 24-in. gas line from Tioga to Fargo, N. D., which would later be extended on to the St. Paul-Minneapolis area.

Schultz said Northern Natural had approached Trans-Canada with this in mind but had been told that it was out of the question. He said changing plans as to route of the branch line would necessitate Trans-Canada's starting again on the long tedious process of obtaining permits.

Confusion in North Dakota . . . His announcement threw into complete confusion the already muddled situation as

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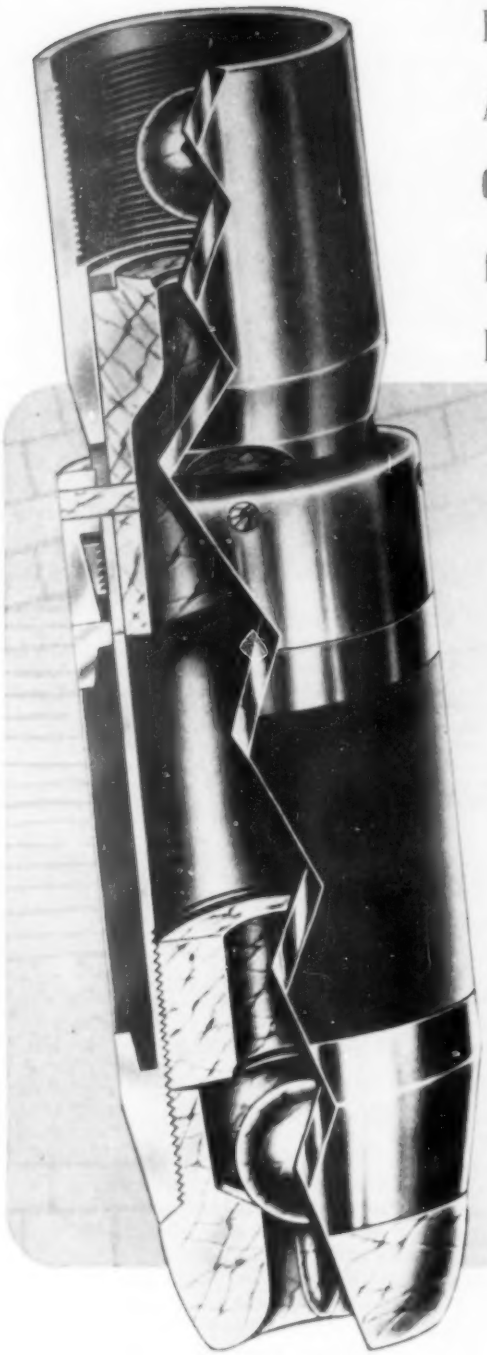

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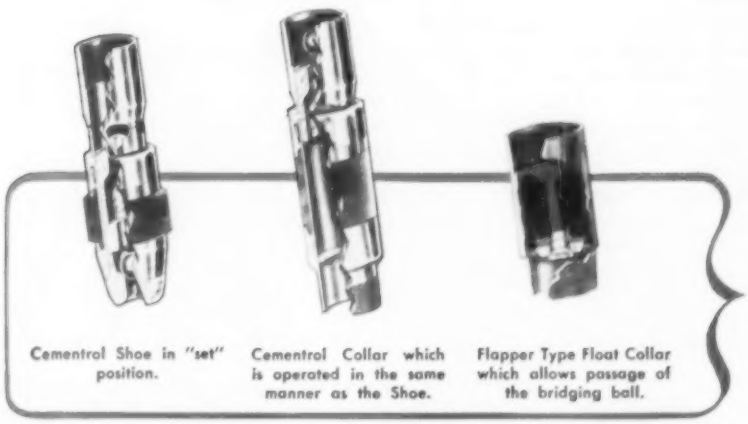

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Cementrol Collar which is operated in the same manner as the Shoe.

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to who will build a pipeline in North Dakota. Northern Natural and a new firm, North Dakota Natural Gas Co., which plans an $8,700,000 line from Tioga to Grand Forks, N. D., have engaged in a struggle this summer over the only substantial gas supply in the state — casing head procured on the Nesson anticline on which Tioga is situated.

North Dakota Natural had this gas wrapped up in contracts with Amerada Petroleum Corp., the big operator in the area. The utilities commission granted the company a certificate to build its line but imposed certain conditions regarding the gas contract and financing with which the company failed to comply. Its permit was remanded *(The Oil and Gas Journal, July 26, page 143).*

Now Schultz' statement has effectively scotched the plan which Northern Natural laid before the commission in its application for the Tioga-Fargo line.

Buck Lake Discovery

Light-gravity crude tested at wildcat south of Pembina

EDMONTON.—Seaboard Oil Co. has confirmed the discovery of light-gravity crude oil in the Belly River sand at its "B" 10-26 Buck Lake area wildcat 14 miles south of Pembina oil field.

A drill-stem test taken at 4,377-4,420 ft. recovered 4,200 ft. of clean 36.2°-gravity oil. The well is drilling below 4,504 ft. toward the Cardium sand, its objective.

Rocky Mountain House . . . The Rocky Mountain House oil discovery is on steady production with indicated flow potential about 80 bbl. per day.

A follow-up well has been started to evaluate further this promising Cardium sand oil strike 115 miles north-northwest of Calgary.

The discovery, Superior et al. 10-27 Rocky Mountain House, is about 20 miles south of the present limits of huge Pembina oil field. The crude oil found at the discovery is light, sweet, 39° gravity. Production is from perforations at 6,185-6,202 and 6,207-14 ft. About 15 ft. of effective pay zone is indicated.

Woodnorth Due Development

BRANDON, Man. — Southwestern Manitoba's Woodnorth field shows indications it is equal to the best of the Virden area producers and is slated for a period of active development in the next few months.

Tire-Track Transporter Designed to Conquer Muskeg

This amphibious transporter, operating on wheels or tracks, is now available for geophysical and drilling operators in Canada's muskeg country. Shown here with a Mayhew 600 drilling rig mounted on the trailer, the transporter is being operated in the field by National Geophysical Co. of Canada, Ltd. Designed and manufactured by North King Equipment, Ltd., the vehicle has a bearing weight of only 1.2 psi. when empty. It can carry payloads of 5,000 to 9,000 lb. over muskeg which will not bear a man's weight. The North King can travel on roads up to 30 miles an hour or through bush, rough country, and muskeg in a walking motion with a front four-wheel drive furnishing power. The optional magnesium steel tracks are designed to take the vehicle over the estimated 10 per cent of terrain that its wheels will not negotiate.

The development is being sparked by the first three flowing wells completed in the field. Production is from the Mississippian limestone, the only source of Manitoba oil.

The discovery team of British American Oil Co., Ltd. and Union Oil Co. of California has 12 sites on its farm-out of three quarter-sections from Canadian Superior Oil of California, Ltd. The California Standard Co. has a substantial block of surrounding acreage. B.A.-Union intends to drill its entire holding as quickly as one rig can handle the work.

The most recent B.A.-Union completion, Woodnorth No. 15-28, flowed 226 bbl. in 15 hours through a 10/64-in. choke from 2,485 ft. It is the best of the three wells drilled to date.

Lube Oil Plant Started

EDMONTON. — Construction has started here on Canada's second largest lubricating oil plant and the first in western Canada.

The new plant is being constructed by Imperial Oil, Ltd., at its 27,750-bbl. refinery here. It ranks second in size to Imperial's lube plant at Sarnia. It will have a daily output of about 2,060 bbl.

Canadian Kellogg Co. has the contract for the plant, which is expected to be completed by July 1, 1955.

Crude distillation facilities will be modified to provide feed stock to the lube processing units. They will include conventional phenol treating and ketone dewaxing, and the unconventional "hydro-finishing" unit which will be the first of full commercial size in existence. The hydro-finishing unit, which is a modification of the hydrofining process, will be capable of processing 2,000 bbl. of lube product per day.

Lake Drilling Planned

ONTARIO—Pan Western Oils, Ltd., has been granted a provincial government permit to drill offshore areas under Lake Huron and Lake St. Clair for oil and gas.

The Lake St. Clair permit covers 66,300 acres offshore from the Walpole Indian Reserve in the southwest corner of Lambton County. In Lake Huron the permit area covers 70,200 acres.

The exploration permits are for 4½ years with rental to the province of 25 cents an acre. A rebate of up to 60 per cent of the annual rental can be applied against exploratory costs. If commercial production is found, the company may apply for not more than 50 per cent of the land under permit. Under these circumstances, the company will be granted a 21-year license at an annual rental of $1 an acre plus royalties of 2 cents per 1,000 cu. ft. of gas or 10 per cent of oil production.

Bureau Policy Hit

Agency will stress basic research under new order

WASHINGTON. — The Bureau of Mines is to be reorganized to emphasize basic research on petroleum and gas and sharply cut its work on substitute fuels.

This is one of the changes included in broad reorganization of the bureau ordered last week by Interior Secretary Douglas McKay. The reorganization is a result of an extensive survey of bureau activities by the Wormser group, which submitted many detailed recommendations.

One recommendation suggests "that the experimental work done solely by the bureau on the production of oil from shale at Rifle, Colo., should cease, and that no further work be done with the new report unless there is substantial contribution by industry under a cooperative agreement."

Scarcity threat cited . . . The report noted that the bureau's research program in oil and gas has not been expanded in recent years. Instead, it stated, the agency has conducted other programs for augmenting oil reserves with production of government-subsidized synthetic liquid fuel on the premise "that the country was running out of oil."

As a consequence, research in improving recovery of known petroleum reserves was neglected, the survey group pointed out.

It was suggested that "strengthening of liaison with industry would assist the bureau in its determination of progress of most merit. . . ."

"The petroleum and natural-gas work of the bureau should regain a position of leadership in the field of research and thus play a more important part in solving the problem of future liquid fuel supplies from any source," the report added.

Two other suggestions resulting from the survey were:

. . . **Research work on synthetic** gaseous and liquid fuels from coal and lignite be confined to small-scale activity and not expanded and developed into large pilot and demonstration plants.

. . . **Unified direction of data** by collection, analysis, and policy appraisal for minerals and fuels; more timely publication of statistical data; and reduction of cost to a minimum for collection and processing of statistics.

Lease Law Conferees Agree

WASHINGTON. — Conferees have agreed on the final terms of a bill ridding the leasing and mineral laws of a long-time legal snafu to permit maximum use of public lands for surface minerals and oil and gas.

Sen. Frank A. Barrett of Wyoming said the agreement was amicable and that in his opinion the conference report would be adopted. This was expected to take place in a few days, but Senate filibuster on the atomic energy bill precluded immediate action.

The Senate, Barrett said, agreed to the House amendment. The effect of this section is to give to holders of mining claims a patent in fee simple in favor of those mining claimants whose claims were preserved under the temporary multiple leasing law of last year, and also to all claimants in the future where there is no application pending or lease granted.

Tankers Approved

Conferees reach accord on oil-vessels measure

WASHINGTON.—A compromise plan for early construction of 20 high-speed oil tankers has been approved by House-Senate conferees.

A deadlock between the two houses of Congress was broken by providing for private construction of 15 of the new super-tankers, with the remaining 5 to be constructed by the Navy.

Legislation passed by the Senate earlier would have authorized private companies to build all 20 of the tankers for long-term lease to the Military Sea Transportation Service. The House bill called for their construction by the Government, at a cost of $150,000,000.

Funds not appropriated . . . Under the compromise measure, the five tankers built by the Navy would cost $37,500,000. Funds for the project are yet to be appropriated by Congress.

The compromise also has a provision giving the Navy an option to buy the privately-owned tankers at termination of their 10-year charters to the Military Sea Transportation Service.

Conference agreement on the tanker bill came after President Eisenhower informed interested legislators that he favored construction of the tankers. Defense Department officials had urged the construction program to relieve the tanker shortage in case of national emergency. As the new tankers are completed the Military Sea Transportation Service, an agency of the Defense Department, is expected to put present tankers in reserve.

Companion bill passes . . . The House, meanwhile, completed action on a bill appropriating $26,000,000 to exchange 20 old tankers for 10 new ones.

The appropriation would cover the anticipated cost of buying and laying up 20 tankers built 10 or more years ago. The money would go to private ship builders to apply on construction of new tankers.

Refining Capacity Up

Number of plants fell, but crude capacity rose in '53

WASHINGTON.—Average crude capacity of the nation's refineries rose by nearly 1,500 bbl. daily in 1953, according to the annual survey of the Bureau of Mines.

At the beginning of this year, the bureau said, throughput capacity averaged 23,759 bbl. daily, compared with 22,270 bbl. a year earlier, although there were six fewer operating refineries—337 compared with 343 on January 1, 1953.

Total daily capacity at all refineries rose from 7,638,661 on January 1, 1953, to 8,006,897 bbl. daily at the first of this year, an increase of more than 368,000 bbl.

Additional crude-oil capacity totaling 397,500 bbl. was reported under construction at the beginning of this year. New refineries included three in North Dakota, two in Washington, and one each in Ohio and Utah, with the remaining capacity consisting of additions to existing facilities.

MEETINGS

Gas Short Course Planned

MORGANTOWN, W. Va.—Principal speaker at Appalachian Gas Measurement Short Course to be held at West Virginia University, August 23-25, will be Mark V. Burlingame. He is vice president in charge of operations for the Natural Gas Pipe Line Co. of America and the Texas Illinois Gas Pipe Line Co.

The course, only one of its kind east of the Mississippi River, is expected to

the men who know pipelining best . . .

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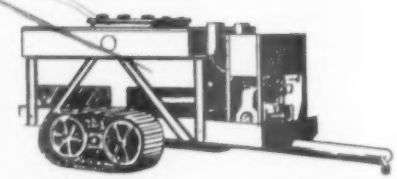
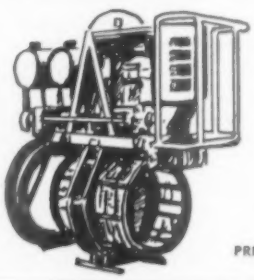
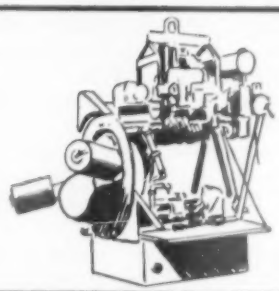
PIPELINE EQUIPMENT



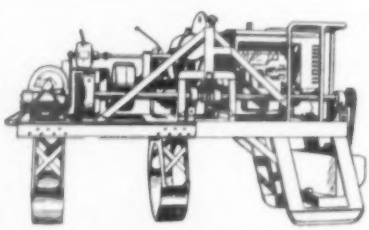
CROSE-LITTLEFORD PIPELINE KETTLES



CROSE CLEANING & PRIMING MACHINES



CROSE COATING & WRAPPING MACHINES



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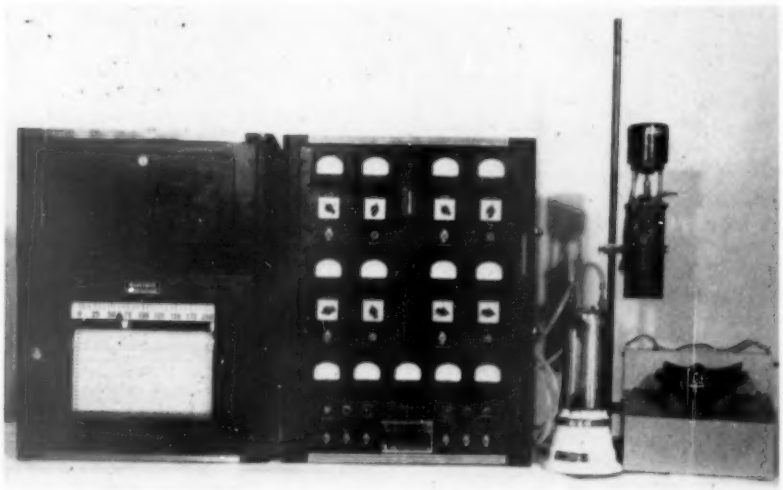
attract about 750 persons this year as compared with slightly more than 600 in 1953. Subjects to be covered in the fourteenth annual course will include fundamentals of gas measurement, automatic controls, planning and design of installations, pressure regulators, orifice meters, large capacity meters, domestic meters, motor valves, and auxiliary measurement instruments.

General chairman for the course is C. G. Moorhead, measurement superintendent of Hope Natural Gas Co., and program chairman is A. M. Hutchison, measurement superintendent of Ohio Fuel Gas Co. Approximately 100 industrial experts will serve as instructors.

SOUTHWEST



Dual Logging Unit Perfected

MIDLAND, Tex.—A versatile new logging unit which automatically analyzes gas in the drilling mud, and records the depth of the hole and rate of penetration is being offered oil operators on a rental basis by Rotary Engineering Co., Midland.

Depth and drilling rate are recorded on a strip chart by means of an electrical switch clamped to a Geolograph on the rig floor. The switch "kicks" the chart as each foot of hole is drilled. The drilling rate is obtained by checking the time interval between the 1-foot kicks.

Automatic gas analysis is not new, but Rotary Enginering claims a distinct improvement for its unit through use of a dual bridge system permitting high and low-voltage gas curves to be obtained continuously with separate detectors. The bridges can be used simultaneously or separately. If just one is used, the other can be put in operation by throwing a knife switch and turning two valves.

The gas-detector is a special type of Wheatstone bridge and consists primarily of a detector filament wire, galvanometer, and balancing potentiometer.

When the apparatus is used to detect gas in cuttings, the cuttings are broken by agitation in a container about half full of water. Any gas present in the cuttings is released and mixes with air in the top of the container. The air-gas mixture passes through a hose across the detector filament, and a portion of it is burned off. The burning effect raises the detector filament temperature and increases the electrical resistivity. This unbalances the bridge system and causes an indicated reading on the galvanometer. The greater the gas content in the cuttings, the greater the galvanometer reading. If only air is present, the galvanometer reading will remain at zero.

Cuttings for the test are trapped in a settling trough, and about a half pint from each 2 ft. of log-corrected cuttings is needed.

If the detector is used with drilling mud, a small stream of mud usually is diverted from the flow line and subpected to agitation as it passes through a gas trap. A small air pump draws the air or air-gas mixture from the top of the gas trap into the detector.

Using the conventional single-detector system, a gas reading customarily is taken first at the normal high voltage, which burns off all combustible gases. Voltage is then reduced to a predetermined figure which does not burn methane but burns all other hydrocarbon gases to some extent.

The new Rotary Engineering instrument, using the two bridges, dispenses with the necessity for applying the zero point correction factor for filament balance. There also is no switching of voltage within the detector chamber and thus no subjection of the air-gas mixture to varying degrees of heat.

New Flood Sought

Two pilot projects also up for action by commission

AUSTIN.—Hudson & Hudson, Inc., is seeking Texas Railroad Commission approval for a water flood which would increase oil recovery from the Yates sand under eight leases in Emperor field, Winkler County, an estimated 5,000,000 bbl. or more.

The eight leases in the West Texas field take in about 520 acres, of which 430 are estimated productive. There are 23 wells on the leases, each producing an average of 4.7 bbl. of 36°-gravity oil per day.

Cumulative production to the first of June was 1,597,769 bbl. The reservoir is thought to be about 85 per cent depleted under primary means of production.

Hudson & Hudson plans to convert 12 producing wells to injection service on a 20-acre, 5-spot pattern. About 300 bbl. of water per well would be injected daily in a closed system into the Yates at about 2,700 ft. Water would be obtained from fresh-water sands at 400 to 500 ft.

Oil in place originally was estimated at 30,700 bbl. per acre. Additional oil recoverable with the flood was placed at 11,800 bbl. per acre.

Two pilot floods proposed . . . Two pilot water floods which may become sizable full-scale programs were laid before the commission by Magnolia Petroleum Co. and Phillips Petroleum Co.

Magnolia plans a pilot project in the 2,770-ft. sand under its Brennan and Servando Benavides leases in O'Hern field, Webb and Duval counties, Southwest Texas. The test will involve 39 acres of the 883 productive acres in the leases and is expected to increase recovery by 150,000 to 200,000 bbl.

Salt water from the Cole sand at 1,700 ft. and the Mirando sand at 2,600 ft. will be injected in a closed system through six input wells. There are 40 wells on the two leases. Production to

the first of the year was 5,072,289 bbl. Gas has been injected into the producing formation since 1941.

Magnolia asked permission to extend the project without further hearing if the pilot is successful.

Phillips proposes a test flood in the Upper Milham sand under its Waggoner Ranch lease in Rock Crossing (Canyon) field, Wilbarger County, North Texas.

About 740 bbl. daily of water from various sands would be injected through the company's Waggoner Ranch 157 and 248. The pilot would recover an additional 125,000 bbl. of oil, Phillips estimates.

Trinity Firms Sold

Rigs, production purchased by Hunt interests of Dallas

DALLAS.—The Hunt oil interests of Dallas have acquired all assets of Trinity Drilling Co. and Trinity Production Co., Dallas, headed by R. L. Rush and J. L. Rush, respectively.

Purchasers were Lamar Hunt, N. B. Hunt, W. H. Hunt, and H. L. Hunt. Purchase price was not disclosed.

Trinity Drilling Co. will be absorbed by Penrod Drilling Co., Madisonville, Tex., a Hunt firm. Trinity Drilling had seven rotary rigs, three diesels, and four natural-gas or butane rigs. Not included was Trinity Canadian Drilling Co. which will continue to be owned and operated out of Calgary, Alta., by R. L. Rush and J. L. Rush. Trinity Canadian operates four rotaries.

The Hunt interests, through the purchase of Trinity Production, will take over roughly 75 producing oil and gas wells on 5,000 acres in West Texas, Southwest Texas, and Southeast New Mexico, plus another 4,000 acres of undeveloped leases. Amount of production was estimated at around 1,400 bbl. of oil daily.

Texas Field Gets Pipeline

MIDLAND.—Service Pipe Line Co. has completed construction of a 27-mile, 8-in. crude line from Midland Farms multipay field in southeastern Andrews County, West Texas, to its Fullerton pump station to the northwest.

The new line is taking about 2,750 bbl. daily of sweet crude produced from the Ellenburger, Fusselman, and Wolfcamp formations in the field. Service expects that throughput will be hiked to 4,000 bbl. daily shortly as more wells are completed in these formations.

The sweet crude from Midland Farms enters the Service trunk line at Fullerton station and is batched through the main line to Wasson and Slaughter fields and piped to Cushing, Okla. The Midland Farms oil has been purchased by Stanolind Oil Purchasing Co. since the new line was placed in operation. Both Stanolind Oil Purchasing and Service Pipe Line are affiliates of Stanolind Oil & Gas Co., which has substantial production in Midland Farms field.

Gas Strike in Devonian

FORT STOCKTON, Tex.—A big Devonian gas strike has been reported in Pecos County's deep Puckett-Ellenburger field.

Phillips Petroleum Co. 1 Evelynjo, on the north side of the field, 30 miles southeast of Fort Stockton, flowed gas at the rate of 26,417 M.c.f. per day on drill-stem test in the Devonian at 10,740-10,860 ft. It leveled off to 37,729 M.c.f. per day with a distillate trace.

The field produces entirely from the deep Ellenburger. The Devonian prospect appears to be as good a well as the Ellenburger wells in the prolific field.

The new shallower pay brings the field into the news for the second time in as many weeks. Just recently Phillips completed the biggest gas well in the field at 1 Odom C. It rated an open-flow potential of 240,000 M.c.f. of gas per day from open hole in the Ellenburger at 13,674-14,775 ft.

Drilling School Founded

ODESSA, Tex.—First term of the new School of Drilling Technology at Odessa College will be held October 11 to November 19.

The school is sponsored by the American Association of Oilwell Drilling Contractors and the petroleum extension service of the University of Texas in cooperation with Odessa College and Texas Education Agency.

Heralded as the most comprehensive and compact course in practical education ever offered the drilling industry, the course will consist of 6 weeks of intensive study. The course will include lectures, demonstrations, panel discussions, conferences and field trips and will cover various phases of the drilling industry.

The spring term will be February 7 to March 18.

Refinery Annexation Upheld

AUSTIN.—The Texas Supreme Court has denied Shell Oil Co.'s petition for a rehearing of its decision approving annexation by the city of Deer Park of land occupied by the Shell refinery and chemical plant.

Shell argued that a retroactive nonlitigation clause tacked on the 1953 municipal validating law by the special session of the Texas Legislature early this year ruled out legal annexation of the plants by Deer Park.

The Supreme Court reviewed the nonlitigation clause, held it to be valid, but sustained the annexation. Justices Griffin, Culver, and Smith filed a strong dissent, reasoning that the Shell tract was a detached area and could not be annexed because no one lived on it to petition for annexation.

The Supreme Court's initial decision, which it affirmed in its most recent action, reversed rulings by both District and Appeals courts, which held the annexation to be invalid. Shell has not revealed whether it will carry the fight further.

Natural-Gas Briefs

CLARKSBURG, W. Va.—Hope Natural Gas Co. has received approval to expand its underground storage facilities in Lewis and Harrison counties by 10 billion cubic feet. The expansion will cost an estimated $1,571,396. The company also has received approval to build 22½ miles of 12-in. line to serve fields in Logan and Mingo counties. The new line will cost an estimated $928,000.

WASHINGTON.—Sen. Lyndon Johnson, Democratic floor leader in the Senate, has voiced hope that President Eisenhower will follow his suggestion and appoint a commission to study the problems arising from the Phillips gas case ruling made by the Supreme Court. Johnson has suggested the commission complete its study in next session of Congress *(The Oil and Gas Journal, June 28, page 82)*. The Texan has opposed a request by the Federal Power Commission for an additional $300,000 needed due to workload created by the Phillips decision.

MINNEAPOLIS.—Montana-Dakota Utilities Co. has received temporary approval from the Federal Power Commission to build about 49 miles of pipeline in Big Horn County, Montana, and to add 440 hp. in compressor capacity to its system in Montana and South Dakota. The utility also has received temporary approval to lay about 4.2 miles of line in Big Horn County and to lease a 2,640-hp. compressor station being built in the county by Montana-Wyoming Gas Pipe Line Co.

Venezuela looks back on . . .

Enviable Drilling Record

OVER the last 6 years, the oil industry in Venezuela has enjoyed an over-all success of about 85 per cent in well completions.

The industry there has drilled 5,745 wells of which 4,873 were producers. Best year was 1952, when 88.8 per cent of wells drilled turned out to be producers, and the poorest was 1950, with 79.2 per cent.

On the average, 95 out of every 100 field wells, 80 of every 100 stepouts, and 34 out of every 100 wildcats were completed successfully in the period 1948-1953. And all but about 1 per cent were oil producers. In Venezuela, where markets are lacking, very few wells are drilled for gas, and a wildcat which produces only gas is usually abandoned as noncommercial.

One major factor in the high proportion of successful completions is that, in Venezuela, the concessions of individual companies cover large blocks of acreage and most fields are operated by single companies. Offset problems arise here and there, but by and large competition is not keen by United States standards.

The result is that each operator develops at more or less his own pace the acreage over which he has rights. Wildcats are drilled only after heavy expenditures of time and money on prospecting, and even development locations are thoroughly studied in advance.

In development drilling, successful completions ranged from 90.5 per cent in 1948 to 96.6 per cent in both 1951 and 1952.

Semiexploratory wells have, naturally enough, been somewhat less successful. Success with new-field and new-pool wildcats has been marked, particularly in the last 2 years when 40 and 42 per cent of all wildcats were completed as producers.

Trend toward wildcatting . . . Analysis of the relative proportions of the three types of wells shows a trend away from development drilling and toward increased percentages of stepout and wildcat completions.

Field wells accounted for almost three-fourths of all 1948 completions, but only a little more than half 1953. Wildcats were only 6 per cent of total completions in 1948, but 14 per cent in 1953. Stepout drilling has increased also, by 10 per cent over the 6 years.

. . . And Here's What It Shows

TOTAL COMPLETIONS

Year	Total	Producers	Per cent success
1948	887	752	84.8
1949	682	548	80.4
1950	677	536	79.2
1951	1,208	1,054	87.3
1952	1,340	1,190	88.8
1953	951	793	83.4
6-yr. avg.	958	812	84.8

WILDCATS

Year	Drilled	Producers	Per cent success
1948	55	14	25.5
1949	71	19	26.8
1950	60	14	23.3
1951	112	34	30.4
1952	117	47	40.2
1953	134	56	41.8
Average	92	31	33.5

DEVELOPMENT WELLS

Year	Drilled	Producers	Per cent success
1948	650	588	90.5
1949	426	386	90.6
1950	442	404	91.4
1951	826	798	96.6
1952	928	898	96.6
1953	516	492	95.3
Average	631	594	94.7

DRILLED STEPOUTS

Year	Drilled	Producers	Per cent success
1948	182	150	82.4
1949	185	143	77.3
1950	175	118	67.4
1951	270	222	82.2
1952	295	245	83.1
1953	301	245	81.4
Average	235	187	79.8

Payment Debated

Anglo-Iranian compensation final issue to be settled

FINAL details of an Iranian oil agreement were being hammered out last week in Teheran.

Legal experts were working on a draft of the settlement document while representatives of the Iranian Government, the British Government, and Anglo-Iranian Oil Co., Ltd., neared an end in their separate discussions of the compensation issue.

Reports indicated that agreement had been reached on all main points at issue between the Iranian Government and the eight-company international oil consortium which was organized to reactivate Iran's nationalized and virtually shut-down petroleum industry.

The negotiations over compensation did not involve the consortium directly since the question was what Iran shall pay Anglo-Iranian for losses incurred during the last 3 years in replacing its former Iranian oil supplies. The settlement plan indicated payments made to Anglo-Iranian by the other seven partners in the consortium would compensate Anglo-Iranian for the physical facilities.

Once the agreements are drafted and signed, the next steps are their submission to the Iranian parliament or Majlis. The influence of the Zahedi Government is expected to be a determining factor in ratification, but in any event, the matter is likely to provoke long and emotional debate.

The Majlis is not due to reconvene before late August. If the document could win approval in September or October, it is believed possible that producing and exporting operations could be initiated around the first of the year.

Up to this stage of the negotiations, with the final agreement not yet concluded, virtually all information so far made public has come from the Iranian side, and that principally from Dr. Ali Amini, the Iranian finance minister and its chief negotiator. The consortium's team, headed by Howard Page, a Standard Oil Co. (N.J.) director, has said little, giving an impression of silent approval of Amini's reports on the negotiating sessions.

Term of agreement . . . It was reported last week that the negotiators had decided that the basic term of the agreement under which the consortium will handle the Iranian oil industry and

market the production should be 25 years with a possible 15-year extension. The extension is contingent on, among other conditions, progressive replacement of foreign personnel by Iranians. This in effect gives a 40-year period for the consortium, which is almost the same as the unexpired term of Anglo-Iranian's old concession.

Equipment and other material used in the operation is to be imported by the consortium duty free. The consortium is insisting on the highest currently authorized exchange rate for the purchase of rials, the Iranian money, for use in the operation. This gives protection against an artificially low exchange rate such as is sometimes forced on oil companies by governments. It also was reported that Iran will receive all its income from the consortium in sterling, 40 per cent of which will be convertible to dollars.

Products Progress

Line to speed deliveries in Ecuador part finished

PART of a products pipeline system connecting the Ecuadorean capital of Quito with the coast has been completed, and arrangements have been made to build the final section.

The completed line is a 46.1-mile, 6-in. from Bucay on the coastal plain in Guayas Province to Palmira in Chimborazo Province. It provides a pipeline bypass to a bottleneck on the railroad carrying products to Quito.

The line was built by the Ecuadorean Railroad Co. with design and engineering by C-R-C Engineering Co., Houston. Nicolas Augustus Maldonado, president of the railroad company, said plans recently were finalized for construction of the Palmira-Quito section.

Railroad shipments of petroleum products were often delayed before reaching Palmira because of overflows of the Rio Chanchan. The grade on this section of the railroad is so steep that one steam locomotive could handle only three 6,000-gal. tank cars at a time, and the demand for products in the interior kept an average of 10 or more locomotives constantly shuttling cars back and forth over this section. The new pipeline rises from an elevation of 1,017 ft. at Bucay to 10,860 ft. at Palmira.

The railroad company said it had been losing the equivalent of about $720,000 a year shipping petroleum products by rail. The pipeline, however, is not expected to be a profitable operation until it is extended on into the capital, according to reports from Quito.

Sicilian Well Testing Asphaltic Crude

This is the rig on the Vittoria, Sicily, test of D'Arcy Exploration Co., Ltd. (Anglo-Iranian). The company found very heavy asphaltic crude in the well, and has been testing to determine if it is commercial. Vittoria is about 15 miles west of Ragusa where a Gulf subsidiary early this year made Sicily's first oil discovery.

International Briefs

Reserves of the new Sui gas field in West Pakistan are being revised upward on the basis of the third well drilled in the area. After the second completion, reserves were estimated at 2¼ billion cubic feet. The second and third wells are 8 miles apart with the discovery between them. Plans are going forward for a 350-mile line to Karachi to utilize the gas. Burmah Oil Co. recently reported its subsidiary, Pakistan Petroleum, Ltd., found gas-bearing limestone but no oil in another West Pakistan anticlinal structure, but the gas was at such low pressure as to be noncommercial.

Deep drilling with equipment capable of reaching 10,000 ft. is planned by the Italian Government company at Fosdondo and Canolo in Reggio Emilia Province of the Po Valley. There are now 14 wells in the area obtaining gas from about 3,800 ft. The present production of about 28,000,000 cu. ft. daily is moved into the Cortemaggiore-Bologna line through a connection at Masone.

Shell, in collaboration with the London firm of F. A. Hughes & Co., Ltd., is experimenting with the application of cathodic protection to oil tankers. The corrosion-prevention technique has been successfully applied to the cargo tanks of the Auris over the last year. Magnesium anodes come into operation as soon as the tanks are filled with seawater ballast. Tests of the use of the cathodic principle for hull protection are now being carried out on the Shell Quest, a depot ship serving the exploration program off the coast of Qatar in the Persian Gulf.

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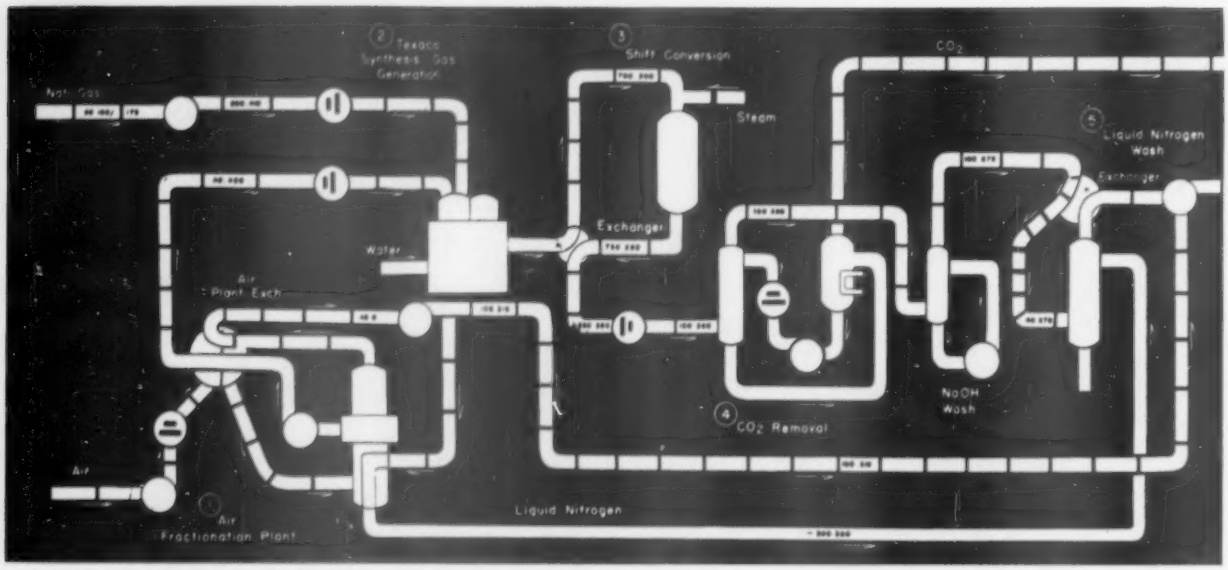


GENERAL PROCESS scheme employed by Grand River Chemical Division of Deere & Co. at Pryor, Okla. The process scheme of this

MAKING AMMONIA—3

New Plant Will Combine Three Processes

Deere & Co. will process 5,000,000 cu. ft. per day of natural gas in plant using parital oxidation—Casale-Pechiney process

by John C. Reidel
Petrochemical Editor

THE new ammonia and urea plant being built by the Grand River Chemical Division of Deere & Co., at Pryor, Okla., is nearing completion.

This new nitrogen-products plant, Deere's first venture into chemical manufacture, will have a design daily capacity of 180 tons of ammonia and 260 tons of urea.

Cost of the plant is expected to be about $18,000,000. It is one of a number of ammonia plants coming on stream this year which represent some new trends in design of ammonia-processing facilities. These plants feature a relatively high degree of process integration, compact layout, reduced equipment size, and extensive use of automatic control as compared with plants of more conventional design.

1. Texaco-Casale-Pechiney

The process employed will be of Foster Wheeler design combining these steps: (1) partial oxidation of natural gas with oxygen to prepare synthesis gas in Texaco Development Co. gas

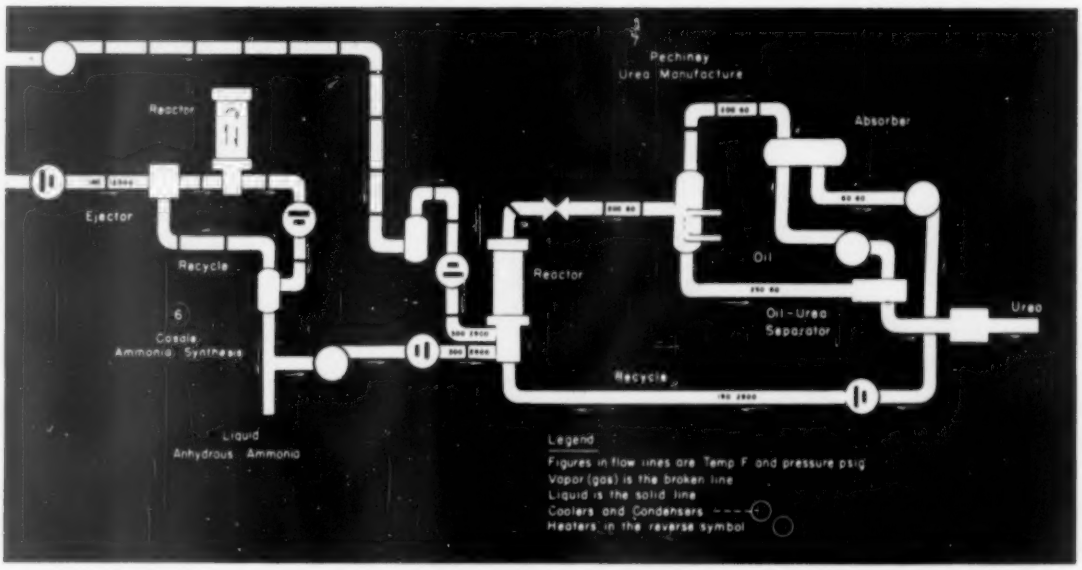
What Is the Casale Process?

AMMONIA and urea manufacture at the Deere & Co., Pryor, Okla., plant, now under construction, will employ the Casale process for ammonia synthesis. This process, licensed for Foster Wheeler Corp., is now in use for the first time in the United States at the recently completed Wyandotte, Mich., plant of Pennsylvania Salt Manufacturing Co. where byproduct hydrogen from electrolytic chlorine cells is used.

The Casale method uses higher operating pressure (9,000 to 12,000 psia.). It also differs in that it recirculates unconverted gases by an ejector. It is stated that at the higher pressure employed by Casale: (1) the catalyst has a greater tolerance for synthesis gas impurities; and (2) higher once-through conversion is obtained. Also, it is possible to condense the anhydrous ammonia with water, thus avoiding use of auxiliary refrigeration equipment necessary at lower synthesis pressures for ammonia condensation.

Advantages cited for the use of an ejector rather than a mechanical compressor for recirculation of unconverted gases include: (1) less cost and maintenance; and (2) minimum oil contamination in gas stream.

In addition to the Deere plant, Foster Wheeler is now building two others in the United States which will employ the Casale process. These are the Grace Chemical Co. plant in the Memphis area (capacity 250 tons of ammonia per day) and the Cooperative Farm Chemical Associates at Lawrence, Kans. (capacity 180 tons of ammonia per day). These plants are designed, basically, to use hydrogen from natural gas. Foster Wheeler is also engineering a Casale process ammonia plant for the Conselho Nacional de Petroleo in Brazil.



ammonia and urea plant combines partial oxidation with Casale ammonia synthesis and Pechiney urea manufacture.

generators; (2) the Casale process for ammonia synthesis, operating in the neighborhood of 12,000 psi.; and (3) the Pechiney process to make urea.

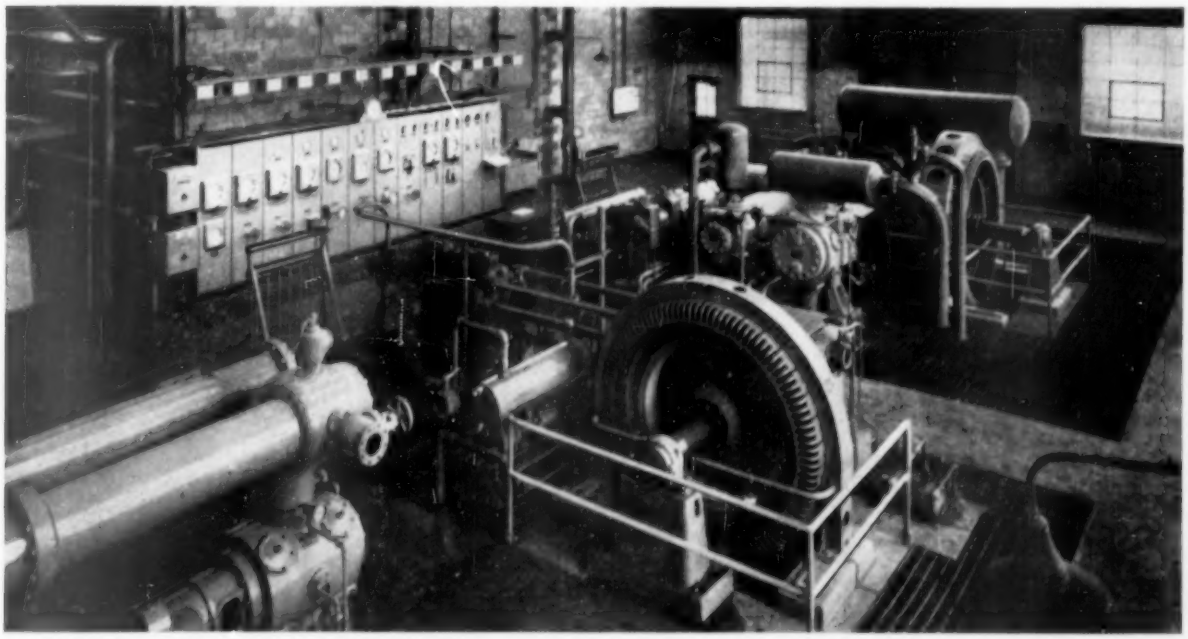
The first ammonia plant to use the partial-oxidation method is that of Spencer Chemical Co., which recently went into production at Vicksburg, Miss.[1] This plant, however, carries out ammonia synthesis at 3,600 psig. and does not make urea.

Why Casale? . . . Employment of the Casale high-pressure process, which is new in the United States, will permit Deere to get by with water cooling for ammonia condensation and will eliminate the auxiliary refrigeration required at lower pressures. Other advantages cited for the high-pressure process are that greater conversion per pass may be obtained at the higher total pressure, some reduction in equipment size may be obtained, and no mechanical circulating compressors are required.

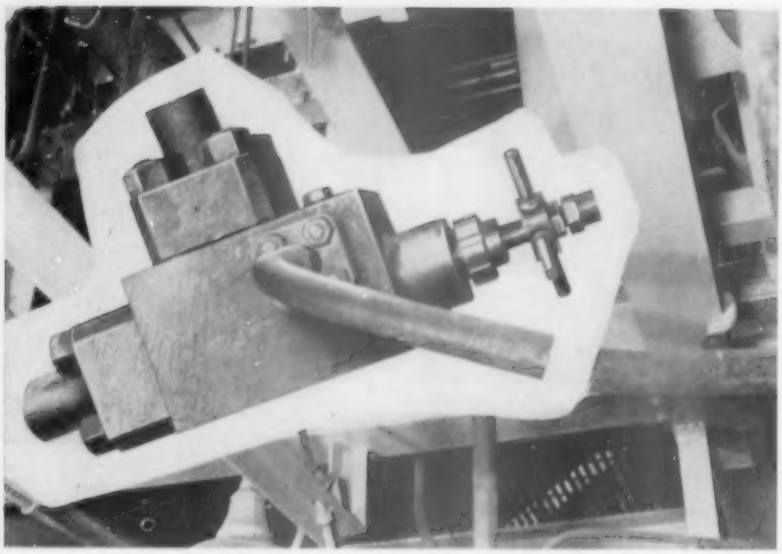
Monoethanolamine contacting and a nitrogen wash will provide hydrogen of high purity for the ammonia synthesis so that long catalyst life may be expected.

2. Natural Gas to Hydrogen

To obtain pure hydrogen for ammonia synthesis, these major steps will be followed at the Deere plant: (1) air fractionation; (2) synthesis gas generation; (3) shift conversion; (4) MEA removal of carbon dioxide; and (5) liquid nitrogen wash. The simplified flow sheet indicates how these steps are tied together in the process



MIXED-GAS COMPRESSOR, hypercompressor, and control panel in an installation employing Casale process.



AN EJECTOR is employed for synthesis-gas recirculation in the Casale process.

scheme employed at the Deere ammonia plant.

Air separation . . . This is accomplished in a plant designed and built by American Messer Corp. The air is first compressed to about 120 psig. and scrubbed with 10 per cent caustic solution to remove CO_2. It is then compressed to about 630 psig. and cooled to 40° F. by ammonia refrigeration with condensation and removal of moisture. The air now passes through activated alumina driers and remove last traces of moisture before it enters the air separation plant.

Here, by heat exchange with effluent gases and an expansion system, the air is cooled, liquefied, and fractionated into liquid oxygen and nitrogen. The oxygen is pumped as a liquid from the air fractionation plant at about 400 psig., goes through the heat-exchange section, is heated further, and is delivered to the gas-generation section as a gas. The nitrogen in vapor state goes through the air-plant heat exchange with incoming air and is compressed. A portion of this nitrogen is further compressed to 300 psig. and reenters the air-fractionation plant to be liquefied for nitrogen wash. The other part of the nitrogen goes to the ammonia synthesis section.

The air-separation plant integrates quite efficiently into ammonia processing employing partial oxidation for making synthesis gas. The air plant provides:

1. Gaseous oxygen for synthesis gas generation.
2. Liquid nitrogen for scrubbing in the nitrogen wash tower.
3. Gaseous nitrogen for final blending into ammonia synthesis gas.

Making synthesis gas . . . Natural gas is compressed and preheated to 1,000° F. and mixes with preheated oxygen in the synthesis-gas generator. The oxygen is preheated to insure uniform temperature at the point of flow control. Controlled partial combustion of methane with oxygen takes place at temperatures in excess of 2,000° F. and at a pressure of about 350 psig.

The synthesis gas made by the noncatalytic partial-oxidation method consists of hydrogen and carbon monoxide in a ratio of about 1.7 to 1.0, with some CO_2, water vapor, and nitrogen, and with unreacted methane reduced down to a few tenths of 1 per cent.

Partial-oxidation advantages . . . These have been summarized[2] as:

1. The process is flexible with respect to feed. "Natural gas or practically any refinery gas, saturated or unsaturated" can be used. Since this is a noncatalytic process, coking or poisoning of the catalyst is not a factor, so the use of a feed gas carrying hydrogen sulfide or unsaturates is permissible.
2. With relatively minor unit changes, a fuel-oil feed may be used in place of gas.
3. Maintenance of the gas-generation section is reduced since a simple, refractory-lined unit is employed and alloy catalyst tubes are eliminated.
4. By operating in the neighborhood of 350 psig., use can be made of available feed-gas pressure. The carbon dioxide is removed from the synthesis gas under pressure in the gas-purification step.

Shift . . . Hot gases from the generators containing approximately 30 per cent of CO are cooled and scrubbed with water. Steam is added and the familiar water-gas reaction takes place with conversion of the carbon monoxide to carbon dioxide and hydrogen. This is accomplished in the shift converter over a catalyst, the mixture of synthesis gas and steam having first been preheated to about 750° F.

It will be noted that shift conversion is accomplished under pressure. This is thermodynamically favorable, yielding a synthesis gas which is low in carbon monoxide. If a condensate supply is available, late-design shift-conversion units do not require any outside steam.

Removing CO_2 . . . After shift conversion, the gas stream, now containing about 25 per cent CO_2, is intimately contacted with MEA solution which removes the carbon dioxide. The rich MEA solution is reactivated in a separate vessel in which the CO_2 is stripped from the absorption medium, and is compressed for urea synthesis. Following MEA contacting, the synthesis gas goes through a caustic wash to remove residual CO_2, is dried, heat exchanged with gases leaving the nitrogen wash, and enters the nitrogen-wash tower.

Note that heat required for reactivation of the MEA is obtained by recovery from the shift-converter exit gases.

Nitrogen wash . . . This removes final traces of oxygen, argon, methane, and CO which would either poison the ammonia synthesis catalyst or build up as inerts in the synthesis recycle loop. These are condensed through contact with the liquid nitrogen. By employing a nitrogen wash, which also removes the methane and other inerts, necessity for purging the synthesis loop is minimized. In the nitrogen wash, part of the pure nitrogen required for ammonia synthesis is thus added.

3. Ammonia by Casale

Process nitrogen gas is now added in proper molecular proportion for the ammonia-synthesis step. The hydrogen-nitrogen gas stream is compressed to a pressure of 12,100-psig., cooled to about 100° F., and enters the Casale reactor by way of the jet-ejector system. Conversion of a portion of the gases to ammonia takes place over a reduced iron catalyst. Reaction product and unconverted gases are cooled and anhydrous ammonia liquid separated out while unconverted gases are recycled through the jet-ejector system. The ejector gets its driving force from the main discharge stream leaving the charging compressor.

A typical summary of requirements

for ammonia manufacture covering the six steps indicated in the flow sheet, through the Casale ammonia synthesis step, has been published by Foster Wheeler (Table 1).

TABLE 1
Typical Summary of Requirements for Ammonia Manufacture, Foster Wheeler Process

	Per ton ammonia
FEED GASES:	
Natural gas (1,080 B.t.u. per s.c.f.), M.s.c.f.	26.20
CATALYSTS:	
Shift reaction, lb.	0.23
Ammonia synthesis, lb.	0.125
CHEMICALS:	
Caustic soda, lb.	11.75
MEA (monoethanolamine), lb.	0.40

	Per ton ammonia			
UTILITIES:	1	2	3	4
Fuel gas, M.s.c.f.	0.9	0.9	7.8	10.9
Steam:				
400 psig., lb.	4,650	8,700	8,700	4,650
50 psig., lb.		*580	*580	
Cooling water, 80° F., M. per gal.	78	95	102	85
Electric power, kw.-hr.	1,120	925	58	65

*Low-pressure steam returned to unit limits.
(1) Compressors—electric-driven reciprocating. (2) Compressors—turbo-centrifugal and motor-driven reciprocating. (3) Compressors—turbo-centrifugal and gas-engine-driven reciprocating. (4) Compressors—Gas-engine-driven reciprocating.

4. Urea by Pechiney

This takes place in two stages: (1) formation of ammonium carbamate; and (2) conversion of part of the carbamate to urea, with formation of water. The first reaction is strongly exothermic, while the second is slightly endothermic. The over-all process is exothermic.

Salt-oil . . . The Pechiney process brings a circulating neutral oil into contact with the ammonia-carbon dioxide mixture in an autoclave. Carbon dioxide comes to the autoclave from the urea-synthesis section at 100° F. and 3,200 psig. (the Pechiney reaction pressure) while liquid ammonia from storage is pumped up to this pressure and heat exchanged to vaporize it before entering the Pechiney reactor.

The circulating neutral oil contains ammonium carbamate as a finely dispersed solid or slurry. This salt-oil is held at a temperature low enough so that the carbamate will be produced in this form. Function of the oil is therefore to absorb the heat of reaction in the conversion of fresh ammonia and carbon dioxide added to the pressure reactor into carbamate.

Separation . . . Urea-carbamate-oil mixture leaving the reactor is let down in pressure to about 60 psig. At this pressure in the gas-liquid separator, unconverted carbamate is changed back to ammonia and carbon dioxide. These enter the oil absorbers and recombine to form ammonium carbamate which is recycled to the reactor. The residual liquid consists of oil and an aqueous solution of urea. This is pumped from the bottom of the liquid-gas separator and goes to the oil-urea-solution separator. Urea solution is purified and evaporated to proper concentration and is pilled for bagging.

Advantages cited for the Pechiney process are:

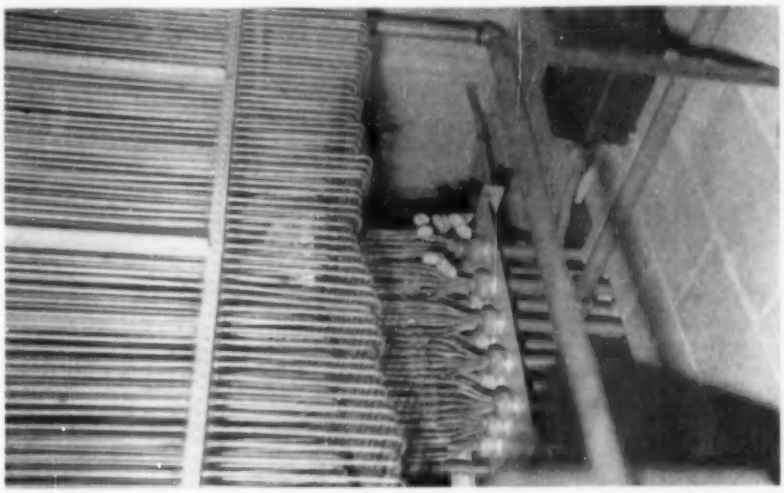
1. Recycling of unconverted carbamate is accomplished by changing it back to ammonia and CO_2. Virtually complete utilization of the ammonia is thus made possible by the recycle.

2. Corrosion is greatly reduced through use of the oil-slurry process in making the carbamate. Corrosion is one of the greatest difficulties experienced in some of the other methods of urea manufacture.

Although urea is presently made in the United States by Allied Chemical & Dye Co. and E. I. du Pont de Nemours & Co., neither of these employs the Pechiney method.

References

1. The Oil and Gas Journal, June 7, 1954, p. 86.
2. Foster Wheeler Bulletin 0-54-1, 1954.
3. The Oil and Gas Journal, Feb. 8, 1954, p. 60.



INSTRUMENT LINES converge at one end of control building and enter armored cable.

Instrument Lines in Cables

ARMORED cable is used as a carrier and protective guard for instrument tubing on the Platforming unit at Great Southern Chemical Co.'s Corpus Christi, Tex. plant.

The instrument tubing lines run in parallel banks behind the panel board in the control room, where they are conventionally supported by strips of strap iron. Near the wall of the control room, the tubes are gathered in clusters and enter various armored cables, with from four to eight instrument lines being carried by each cable.

The cables extend through the wall and run individually to various parts of the unit. Junction boxes are established at needed points so that one or more cables can meet there and allow instrument lines to branch off to be connected to individual instruments. The armored cable is used to protect the branch lines in the run from the junction boxes to the instrument area.

The cable eliminates the maze of instrument tubing commonly found in operating areas.

ARMORED CABLES pass through building and then run individually to various parts of unit.

Man in foreground is painting identifying bands on inspected rods, while unit is being operated in background on well location.

Electronic inspection finds the weaklings, pointing way to

Prevention of Sucker-Rod Failures

by F. Lawrence Resen
Gulf Coast District Editor

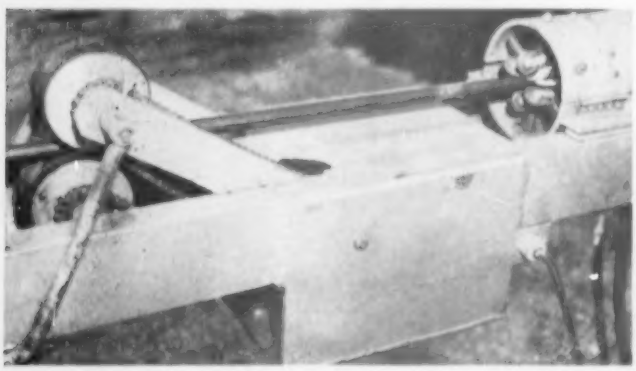
THE electronic inspection of sucker rods is being utilized to pinpoint those with defects or limited life, thereby cutting down on shutdown periods due to parting of rod strings.

The procedure followed is to pass individual rods through a magnetic field, with imperfections picked up on a recording tape. The rod is then visually inspected and classified as to its condition. Upon rerunning the string in the well, the limited service rods are segregated and run so as to be subjected to light loads. Meanwhile, those in good condition would be "uphole" where they would carry the brunt of the load, while the defective rods would naturally be scrapped.

As a result of the inspection, it is possible to remove those rods exhibiting defective tendencies from a string without replacing the entire string. At the same time, rods may be salvaged from scrap piles by running them through the instrument and classifying according to condition, so that the good and limited service rods may be reused rather than being sold as junk.

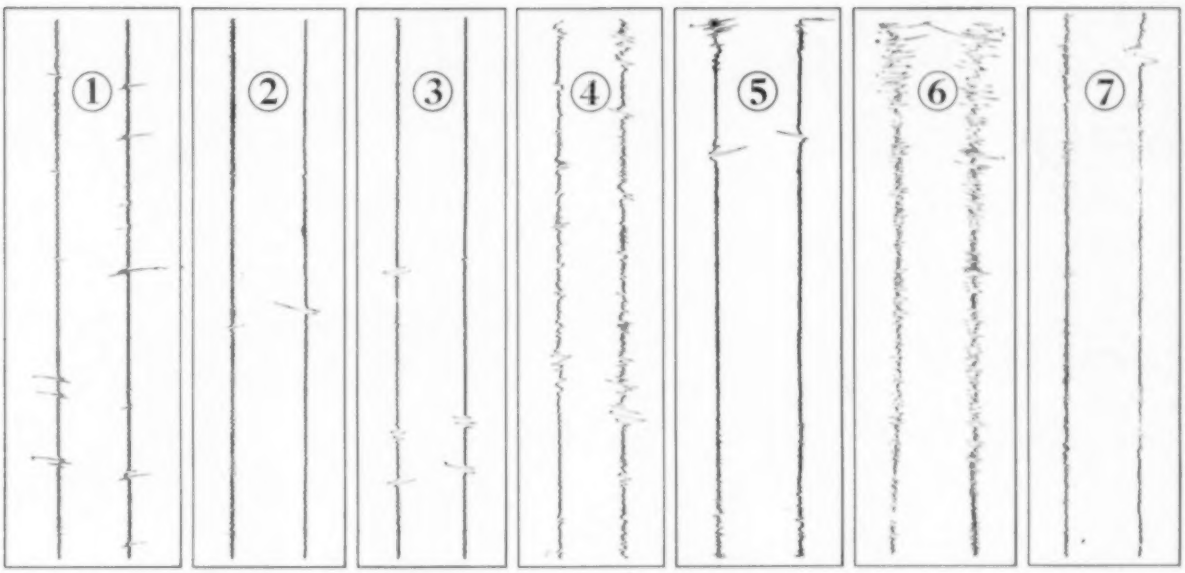
How it works . . . The equipment used to inspect the rods consists of a magnetic-type detector, a scraper, driving rollers, recording apparatus with amplification units, and racks with builtin rollers for guiding the rods. A rod is placed on a guide rack and fed into the initial drive mechanism. This consists of two rollers, with the upper one spring loaded and both upper and lower rollers chain-driven by a builtin electric motor. Those force the rod through a scraper consisting of four hollow-ground knife blades which fit around the circumference of the rod. Paraffin and scale are removed from the rod so the magnetic detector shoes can make good contact.

The rod next passes through the de-



Closeup shows rod leaving magnetic detector, with spring-loaded guide rollers used to insure even movement through the unit.

Operator observes stylus recording on this tape, and merely has to flick a button to stop rod on variation in signal.



EXAMPLES OF TYPICAL TAPE LOGS . . . These logs show a variety of conditions, such as (1) corrosion fatigue, (2) small fatigue cracks, (3) solitary pitting, (4) general corrosion pitting, (5) changes in structure, (6) general fatigue, and (7) stretch.

tector, where the area under examination is subjected to a strong longitudinal magnetic field of varying intensity. The change of permeability of the metal is recorded by a stylus-recorder mechanism. If a fatigue crack or stress concentration area is encountered, the permeability of the metal decreases, and the change is indicated by a deflection of the recording galvanometer. Since the rod is magnetized close to the saturation point, any area of abrupt change in hardness, discontinuity, or stress concentration will not be able to pass all the flux lines set up by the electromagnet. Therefore, a certain number of lines are forced around the point. A pickup of these lines is amplified and recorded on a tape as it passes through the recording unit. (Figs. 1-7).

The rod travels into a second drive roller which sends it onto a receiving rack. It is then color-stripped and centerpunched according to the classification, as decided by the operator.

Recording tape . . . Two separate signals are picked up from the detector, amplified, and recorded on the tape. One of these is for the upper half of the rod and the other for the lower half. While the rod is being forced through the detector at a constant speed of 55 ft. per minute by the driving rollers, the signal is being recorded at the same time, with 1 in. of tape being equivalent to the travel of 6 in. of rod.

The operator observes the two signals on the tape and at any questionable variation in them, throws a switch which stops both the tape and the rod, the driving mechanisms of both being synchronized. Next, he sprinkles magnetic powder over the portion of the rod just leaving the detector. This makes it possible to pinpoint the location of the defect and to definitely identify fatigue cracks as against some forms of pitting plus fatigue cracks which cannot be determined from the tape indication alone.

Depending upon the condition of the rod, number and type of imperfections, etc., it receives one of the following classifications:

1. New rods in good condition—white band of paint.

2. Used rods in good condition—yellow band of paint.

Magnetic powder is used to bring out defects more clearly. Magnetic detector is in housing at right.

3. Limited service rods—blue band of paint.

4. Defective or scrap rods—red band of paint.

Main purpose of the inspection is to highlight the fatigue cracks in the rods and contributing factors which lead to stress concentration and fatigue failures. These include serious pitting, gouges, serious corrosion, mill defects, abnormal structural variations, and rod wear. The instrument is neutralized so as not to indicate normal variations in hardness due to manufacture of material for it is felt the primary emphasis should be placed on stress concentration.

Typical logs . . . Examples of typical tape logs may be seen in Fig. 1-7. As might be expected, the interpretation of these would require a degree of familiarity with the instrument. However, it may be realized that a combination of the intensity of the variation plus its frequency would be used in classification of individual rods.

In Fig. 1 may be seen an example of corrosion fatigue. Here the stylus has moved erratically throughout this complete length of rod, and it is reasonable to expect the rod is defective. In Fig. 2, the impression made on the tape by a rod free of defects may be seen with the exception of the two pips near the center of the bands. This is evidence of a small fatigue crack, and the use of the magnetic powder would determine the classification of the rod.

Another condition, pitting, may be seen in the log shown in Fig. 3. Here the solitary pitting shows up as pips

TABLE 1

Co.	Field—	Pump depth, (ft.)	No.	Size (in.)	Class	Mo. on stream	Prod. B/D	Salt water	Oil	Grav.	Stroke (in.)	S.p.m.	Pump	Failures inspct.	Prev. fail. (mos.)
A	Bemis, Kans.	2,800	112	⅞	2	8	200	*59	41	35	54	18	2″12′	None	1½
A	Bemis, Kans.	3,225	129	⅞	2	7	26	*88	12	35	44	18	2″12′	1	1
A	Bemis, Kans.	3,200	128	⅞	2	8	15	*93	7	35	54	18	2″12′	None	2
A	Bemis, Kans.	3,325	133	⅞	2	5	20	*91	9	35	44	18	1¾″9′	None	1½
A	Bemis, Kans.	3,200	128	⅞	3	6	6	*76	24	35	24	12	1½″	None	½
A	Bemis, Kans.	2,600	104	⅞	70-2 34-3	8	460	†450	10	35	44	22	2¼″	4	3
B	Trapp, Kans.	2,473	25	⅞	2	8	555	‡548	7	38	54	21	2¼″	None	2
			15	⅞	3										
			45	¾	2										
			13	¾	3										
B	Trapp, Kans.	2,698	19	⅞	2	12	560	‡537	23	39.7	54	17½	2¾″7′	1 Pin 1 Box	½
C	Baxterville, Miss.	4,516	10	⅞	2	3	482	358	124	17	74	18	2″	None	
			30	¾	2										
C	Baxterville, Miss.	3,518	12	⅞	3	9	450	424	26	14	74	19	2¼″	2	
			56	¾	2										
C	Baxterville, Miss.		27	⅞	2										
			9	⅞	3										
			55	¾	2	9	35	1	34	14	54	14	1¼″	None	
C	Eucutta, Miss.	4,200	55	⅞	2	9	333	319	14	33	74	16	2″	None	
C	Idlewild, Miss.	3,984	48	¾	2	2	433	368	65	40	64	15	1½″	None	
			8	⅝	2										
C	Sibley, Miss.	3,938	99	⅝	2	3	145	52	93	43	64	10	1½″	None	
			56	¾	2										
C	Brookhaven, Miss.	6,490	*126	¾											
			132	⅞		10	66	3	63		54	12½	2″16′	None	
C	Brookhaven, Miss.	7,083	94	⅞											
			*97	¾											
			29	¾		4	58	24	34		54	11	1½″9′	None	
C	Brookhaven, Miss.	6,977	106	⅞		3	112	96	16		54	14	1½″9′	None	
			§172	¾											
D	Wallalieu, Miss.	6,500	§75	⅞		10	188	180	8		108	10½		None	
			112	¾											
			67	1											
D	Wallalieu, Miss.	6,000	84	⅞		6	320	40	280		108	12½		6	
			§82												
			71												
D	Brookhaven, Miss.	7,083	94	⅞											
			53	¾		4	58	24	34		54	11	1½″9′	None	
			§97	¾											
			29	¾											
D	Brookhaven, Miss.	6,977	§172	¾		3	112	96	16		54	14	1¾″9′	2	
			106												
D	Brookhaven, Miss.	6,490	§126	¾											
			132	¾		10	66	3	63		54	12½	1½″9′	None	

*Very corrosive. †Pitting H_2S. ‡Moderate corrosion. §Of the rods on this well, only these were inspected electronically.

with wide bases. While the further inspection of the rod itself and a comparison of the pips can be made when the instrument is stopped, it can be easily seen how positive an indication shows up on the tape when a defective point on a rod passes through the detector.

In Fig. 4 may be seen the effects of a rod where general corrosion pitting has caused the signal to fluctuate almost constantly while the rod passed through the detector. A change in structure causes the styluses to react in direct opposition to each other as shown in Fig. 5. General fatigue as shown in Fig. 6 is similar to general corrosion pitting in that the stylus fluctuates almost constantly, but here, there is no wide base on the signals as in Fig. 4. Stretch, which may be caused by pulling a string of tools with a stuck pump, etc., shows up as an S-shaped curve as in Fig. 7, at the upper section of the right-hand signal.

Field Applications

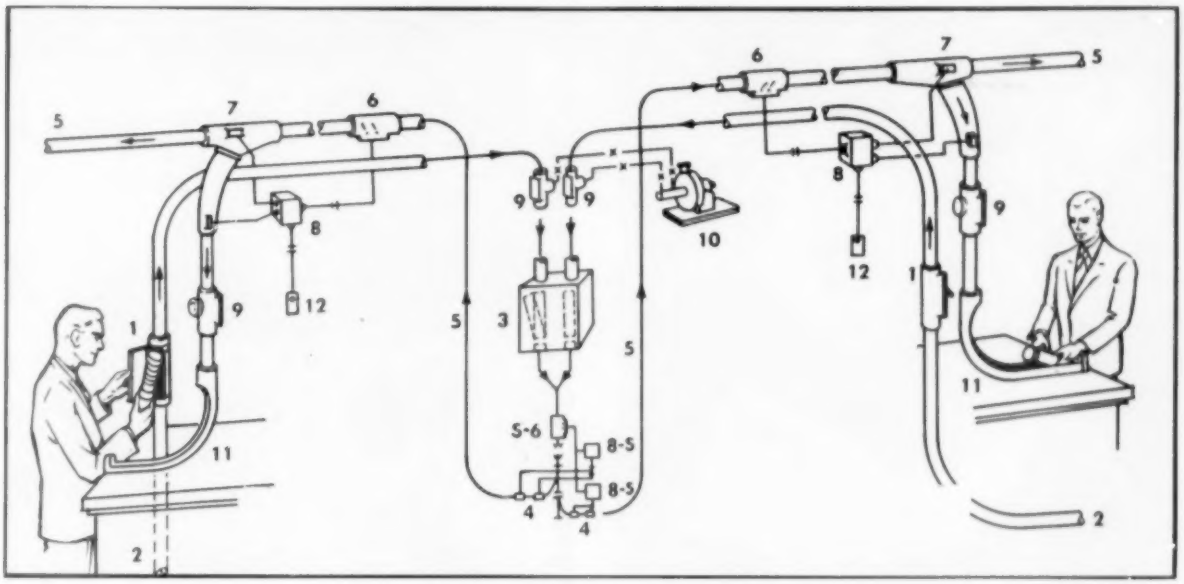
Records were set up and maintained on 22 wells operated by four companies in nine fields, in Mississippi and Kansas. The data are shown listed in Table 1. Comparative data on number of failures before and after inspection are available on the eight wells located in Bemis and Trapp fields in Kansas. All of the wells pumped between 2,500-3,500 ft., under corrosive conditions ranging from moderate in Trapp pool to extreme in Bemis.

In five of the eight wells, with a cumulative producing time of 35 months, no strings failed. Previously, one-half to two failures per month had been experienced in each well. On the other three wells, seven failures occurred in 27 cumulative months. One particularly corrosive well had been experiencing three failures per month in this group.

In the other 14 wells, all located in Mississippi, 11 experienced no failures during 67 cumulative months. Ten failures were experienced on three of the wells during a total of 18 months, with six occurring on one well. It is interesting to note that of all the wells tested strings were inserted into 13 wells made up from rods previously junked by the operators. Only three of these wells experienced breaks.

Salvage . . . The salvage aspects of the testing unit are quite interesting, for many operators have pulled entire strings out of holes and set them in the scrap heap. The possibilities of inspection may be seen in one operator's experience on the Texas Gulf Coast, wherein 1,364 scrapped rods were inspected and of these a total of 814 were determined to be in good or limited service condition.

The Sonoscope sucker-rod inspection is a service performed by Tuboscope Co., Houston.



SCHEMATIC DIAGRAM of automatic tube system.

1. Dispatch inlet
2. Sending tube
3. Carrier spacing device
4. Line selector switch
5. Receiving tube
6. Flying selector
7. Station switch
8. Elektrigger power unit
9. Terminal
10. Exhauster (blower)
11. Delivery chute
12. Power outlet

. . . A message in 40 seconds

Pneumatic Tube Speeds Communication

Transmittal time cut from possible 30 minutes under old system of using messengers . . . Here's a moderization first

by C. H. Hall

THE first industrial automatic-type pneumatic tube system ever to be installed in this country has been placed in operation at the central mechanical building of the Baton Rouge refinery, Esso Standard Oil Co. No central transfer desk or desk operator is required with the automatic-type system, which is the basic difference between the operation of this and a conventional-type tube system.

The installation was made to provide rapid, direct, and economic air tube delivery of correspondence, job orders, sketches, and drawings between the eight control stations in the 141,600-sq.-ft. building.

Stations are located at the dispatch center, machinists' section, electricians' section, safety-valve and tube-bundle section, boilermakers' section, pipefitters' section, record room, and storehouse order section. Approximately 100 messages per hour are presently being transmitted between these stations during the 8-hour daytime shift.

Author is engineer, mechanical engineering department, Baton Rouge refinery, Esso Standard Oil Co.

Any one of these stations can send messages directly to any other station in an average transmittal time of *40 seconds!* The system is thus eliminating delay, expediting shop operations and increasing over-all shop efficiency.

Layout

A vacuum is produced in the 3,100 ft. of 4-in. o.d., 16-gage steel tubing by one 7½-hp. and one 2-hp. electric-driven centrifugal exhauster. The 7½-hp. exhauster develops 700 cu. ft. per minute at 24 oz. vacuum, and the 2-hp. exhauster develops 180 cu. ft. per minute at 20 oz. vacuum.

The installation is composed of two individual systems, as indicated in the schematic diagram above. The record room and storehouse order section stations are on one system; the six additional stations are on the other system. Future stations, when required, can be easily added to the installation.

Each system is composed of two loops with a sending and receiving tube passing each station.

Carriers

Correspondence is carried through the tubes in felt-end, plastic cylindrical carriers which have an internal length of 12⅜ in. and an inside diameter of 2⅜ in.

On the outside of each carrier there are three adjustable and seven fixed brass rings to control the movement of the carrier in the tubes. To dispatch a carrier to a particular station, one of the movable rings is dialed to a code *letter* designating the *system* on which that station is located. Another moveable ring is dialed to the code *number*

It goes in here . . . . . and comes out here

designating the *number* of the station in the system. Dialing the movable rings completes the circuit between these and the fixed ring.

The circuit of one movable ring and one fixed ring diverts the carrier into the correct system. The circuit of the other movable ring and another fixed ring diverts the carrier into the proper station.

Spacing Device

When a carrier (see schematic diagram) is placed into one of the dispatch inlets (1), it travels in the sending tube loop until it reaches the double valve terminal (9). The carrier then falls by gravity to the carrier spacing device (3).

The carrier spacing device consists of two bottom-hinged tube sections which are moved back and forth by an eccentric drive powered by a ¼-hp. electric motor. For an instant during the cycle of this hinged section, each of the two sending tubes (2) are aligned with the one spacing device outlet tube. The carrier is held momentarily in the sending tube where it moves a time delay release mechanism that allows it to drop through the spacing device into the outlet tube. This occurs the instant the sending and spacing device tubes are aligned.

The spacing device is one of the "brains" of the installation since it prevents two carriers from ever reaching the same point in the system at any given time.

System Selector

The carrier moves from the spacing device to the system flying selector (S-6). As the carrier passes through the selector, one of its sets of rings completes an electrical circuit by touching a pair of contact-making brushes (wires) which extend into the tube and are spaced the same distance apart as the particular set of rings. This momentarily completed circuit energizes the Elektrigger power unit (8-S) corresponding to the carrier ring setting.

The power unit which opens the correct line selector switch (4) contains a transformer, oxide rectifier, condenser, and a single relay.

The system selector is another brain of the installation since it determines which system receives the redispatched carrier without the need of a central transfer desk and operator.

Station Selector

From the system selector, the carrier proceeds through the receiving tube (5) to the designated station flying selector (6). With the exception of brush spacing all station selectors are identical to the system flying selector.

As the carrier passes through the station selector, its other set of rings, when set for that specific selector, completes an electrical circuit. This circuit energizes the Elektrigger power unit (8) which energizes the solenoid on the station switch (7). The solenoid actuates a deflector that moves into position and causes the carrier to drop through the terminal into the designated station.

All main tubing lines are horizontal and all takeoff lines to stations are vertical. This permits carriers to drop by gravity from the main line into the station. All station selectors are located in the horizontal tubing runs 15 ft. ahead of the station switches to allow the deflector to be in proper position before the carrier reaches the station switch.

Circuit Breaker

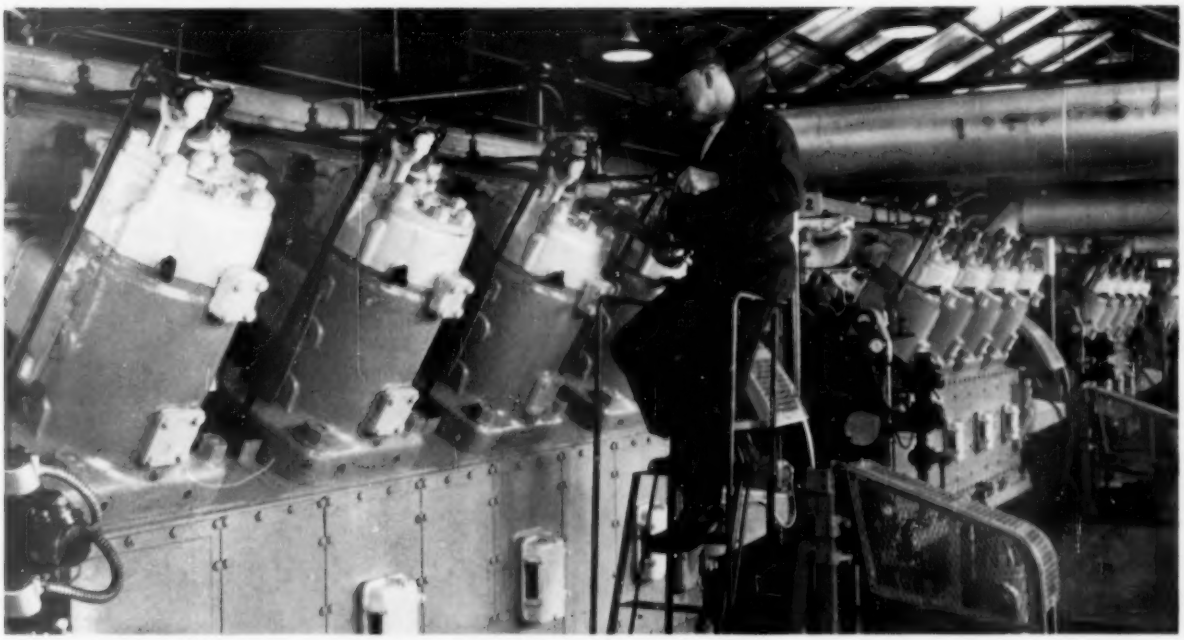
A circuit breaker, located on the vertical branch of the station switch, is engaged by the passing carrier. This deenergizes the power unit and allows the deflector to return to its original position. Successive carriers, not designated for this station, are then permitted to pass along the main tubing line.

The entire operation for one carrier is completed before the spacing device permits another carrier to pass this station switch. Full carrier velocity is maintained during the entire operation.

All orders for shop work pass through the dispatch center, which directs them in writing to the primary work section involved. While the work of the primary work section is in progress, or when the work of this section is completed, the work order is forwarded to the next work section involved. Each work section orders its own material as needed from the storehouse.

The record room may be requested by any section to furnish past data on a piece of equipment being repaired. When a job has been completed, the work order is returned to the dispatcher by the last section involved. The dispatcher routes the completed job to the field and sends the completed work order to the record room for filing.

This new-type pneumatic tube system was developed by Lamson Corp., Syracuse, in conjunction with its European affiliates.

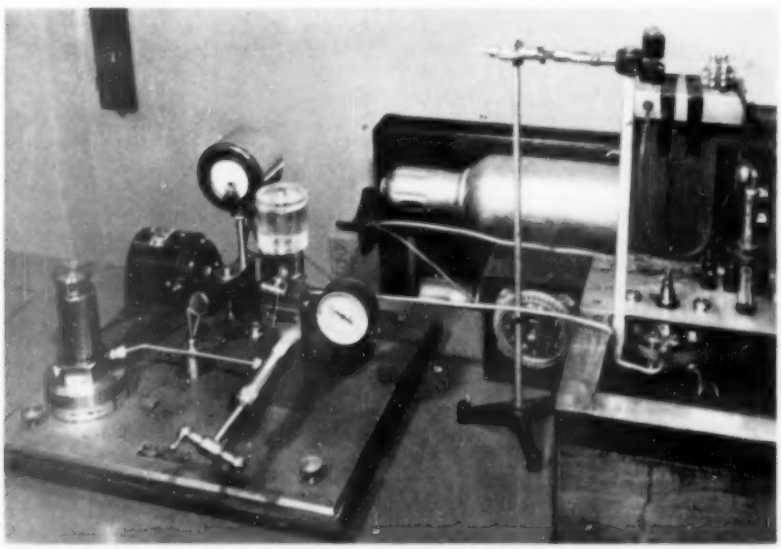


USE OF SILICONE grease on the injection valves of these Cooper-Bessemer gas-engine compressors reduced lubrication frequency from three times per day to three times per year.

SILICONES—New Tools for Petroleum Operations

. . . They fill widely differing needs in pipeline maintenance

by F. Lawrence Resen
Gulf Coast District Editor



SILICONE FLUID in this Burnett apparatus, used by T.G.T. for determining deviations of natural gas from Boyle's law, functions properly in the hydraulic system over a wide range of testing temperatures.

AS in other segments of the oil and gas industry, silicone products have been used in widely diversified applications on pipeline installations.

Silicone fluids have been used in laboratory apparatus, silicone greases on compressor injection valves, and silicone paints on compressor exhaust mufflers. In the laboratory the low-temperature stability of silicones is most significant while in the other applications high-temperature stability is required.

Gas deviation . . . A laboratory application is exemplified by Tennessee Gas Transmission Co.'s use of a dimethyl silicone fluid in the Burnett apparatus, for determining deviations of natural gas from Boyle's law.

T.G.T. transports and sells as much as 1½ billion cubic feet of natural gas daily through its pipeline system, and the magnitude of this volume makes exact measurements imperative. De-

viations from natural-gas laws, however small and whatever the cause, must be readily computed from acceptable tables.

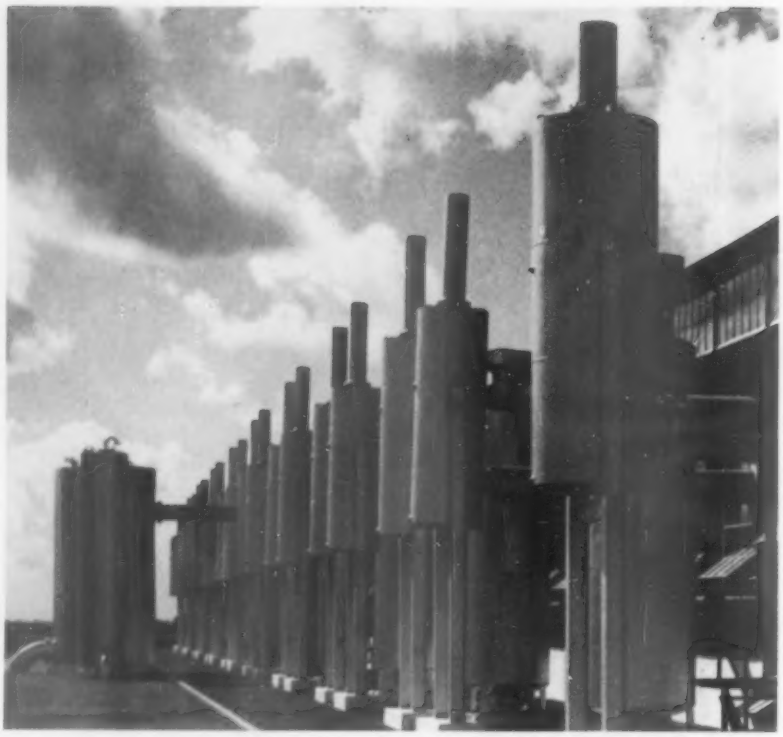
To establish such tables, T.G.T.'s research laboratory has determined these deviations on a wide variety of natural gases of different specific gravities at pressures ranging up to 4,000 psi. and temperatures from —51° to +200° F.

The apparatus used to conduct these investigations provides a means of varying the pressure of a volume of gas by consecutively subtracting a definite percentage mass at constant temperature. When enough of these consecutive pressure steps are made, the deviation factor can be determined by combining graphical plots and calculations. The pressure is determined by a hydraulic-oil deadweight system which is balanced against the gas in a differential pressure cell. To maintain the given operating temperature, this cell along with the rest of the gas-containing apparatus is placed in a constant-temperature bath.

The apparatus presented no problems at normal temperatures, but when measurements as low as —51° F. were attempted, the organic hydraulic fluids employed could not maintain the same viscosity in the differential pressure cell and in the deadweight piston gage. Oils that worked freely at low temperatures were too thin to support the piston and those heavy enough to support the piston would either freeze or become too sluggish to retain sensitivity in the differential pressure cell. Silicone fluid, with its flat viscosity temperature curve, was placed in the hydraulic system where it functioned to meet the requirements of the apparatus without difficulty.

Injection valves . . . Injection valves in gas compressors have a tendency to build up deposits in the valve ports which can restrict the flow of gas. Operators at a compressor station in a lower Michigan field, however, have reduced their scheduled lubrication frequency from three times a day to three times a year, using a silicone grease. As a result, down time and cleaning costs have been considerably lessened with working gas pressure dropping from 43-48 psi. to 40 psi.

Almost since the station was first built 5 years ago, operators of the five Cooper-Bessemer 440-hp. compressors have spent over an hour and a half per shift greasing the injector valves on the engines. Even so, valve stems became pitted and scored as operating temperatures caused the conventional grease to carbonize rapidly on passages and walls. Frequent dismantling and cleaning were required and in 1952, every single injector was cleaned and replaced 15 times.



SILICONE-BASED PAINTS are used on these exhaust mufflers at T.G.T.'s East Barnard, Tex., compressor station.

Late last summer a switch was made to the organo-silicon grease, Dow Corning 41, which is a nonvolatile silicone oil thickened with carbon black. All 40 injectors were cleaned and greased, with plugs used to replace the lubricating fittings to prevent unauthorized lubrication.

After a month's run, the injectors were again greased, and once again a month later. They were then taken down for inspection and found to look as good as new. As a result, the maintenance men now plan to relubricate them only three times per year.

Electrical equipments . . . At pipeline stations, as well as other industry locations, explosionproof electrical equipment is used to cut down possible hazards from inflammable gases. In equipment manufactured by Crouse-Hinds Co., the threaded shafts and covers of the equipment are movable or removable and must be kept well lubricated.

One type of lubricant the company recommends for use during installation or maintenance of all condulets with threaded covers, shafts, or other threaded parts is termed OSL. This has a silicone grease base which remains stable through a —40° to +500° F. range and is nonconductive so it can be used next to exposed live circuits without causing grounds or shorts.

The tmperature stability of this special silicone grease is especially advantageous because it permits the operating shaft to move freely at either high or low temperatures. Consequently, OSL lubricant makes possible a permanently watertight shaft joint that resists corrosion as well as the effects of temperature extremes.

Exhaust mufflers . . . Silicone-based paints are especially useful where high temperatures destroy organic coatings. At the East Bernard, Tex., compressor station of T.G.T., aluminum-pigmented paint based on a 100 per cent silicone vehicle has been used on 30 vertical exhaust mufflers for over 6 years.

Surface temperatures on these mufflers range from 650° F. at the inlet to 600° F. at the final exhaust point. Only the mufflers themselves are finished with silicone paint, with the heavily insulated exhaust manifold being covered with aluminum sheeting.

When the mufflers need painting, they are lightly buffed down and resprayed with silicone paint. Except on rare occasions, when wet weather has interferred with the subsequent curing-in service of the coating, the finish retains its original appearance, integrity, and corrosion resistance the year around.

Raw water is collected in the 1,000-bbl. tank at right, and after passing through the filters runs to the surge tank at left.

Diatomaceous earth is continuously added to raw water on inlet side of the two filters. Slurry is batch mixed in tank in foreground.

Flexibility plus builtin safety at East Coalinga

Pilot Water Flood Automatically Controlled

by D. H. Stormont
West Coast District Editor

HIGHLY flexible and almost completely automatic operation is being achieved at the pilot water flood Shell Oil Co. recently launched in East Coalinga field of northern San Joaquin Valley, California.

Electronic controls regulate the production, storage, transfer, filtration, and injection of the brackish water used in the experimental project. Once the rate of water injection into each of four input wells is manually set, automatic controls act to insure a continued supply of chemically treated, filtered water. Builtin safety controls prevent damage to the pumps and motors involved.

Shell started the pilot project last summer to determine the feasibility of water flooding the 1,200 to 2,500-ft. Temblor producing zone. It consists of four input wells drilled in a diamond around an old producer. If the shallow sands prove adaptable to flooding, all of Shell's Temblor properties may be placed under flood.

Water is obtained from two Pliocene wells about 3 miles distant from the injection wells. The water is so brackish and has such a high sulfate content that it is unsuitable for domestic or agricultural use. Because it becomes highly corrosive upon coming in contact with air, a closed system is used throughout. Early experiences show it to be quite compatible with the reservoir waters.

Water production . . . The two shallow wells produce about 10,000 bbl. daily, a portion of which goes into camp fire-hydrant system and to other field uses. The water is lifted by two electrically driven, multistage, submersible centrifugal pumps, each of which has a 6,000-bbl. per day capacity. At the surface, water passes through a header into two 2,000-bbl. storage tanks. A gas blanket is maintained in the tanks so that air cannot contact the water.

Transfer of water is by means of a two-stage centrifugal pump driven by a 75-hp. electric motor. A time-cycle controller starts the pump four times daily, with these controls being overridden by high and low-level float switches in the tanks. In addition a high-level float control in a step tank 12,000 ft. away operates a back-pressure switch to shut down the pumps whenever the system is filled.

Chemicals for controlling corrosion and bacteria and for reducing the surface tension of the water are injected at the discharge side of the pumps. They consist of a blend of quarternary ammonium chloride compounds.

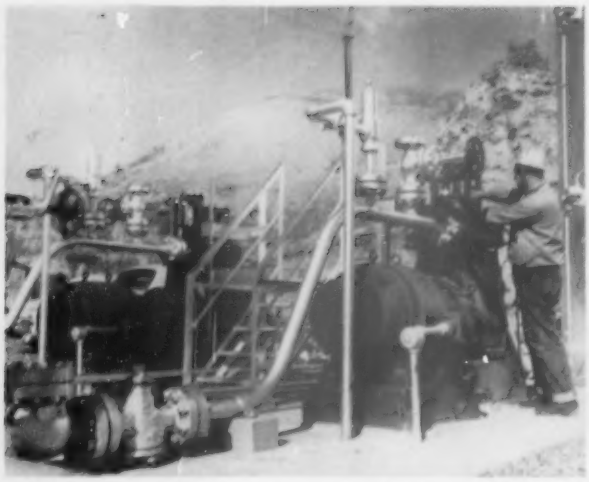
At the aforementioned step tank, water for camp and field use is withdrawn from the system. The 1,000-bbl. tank is vinyl-plastic coated. As at the well site a pressure controller acts to maintain a gas blanket inside the tank.

Automatic controls at this point include the high-level float switch and a time cycle controller. Six times daily the latter starts up a 40-hp. pump to move the water the remaining 6,000 ft. to the filtering and injection plant. In addition float-operated controls in the field water storage tank act to divert water into this system as needed.

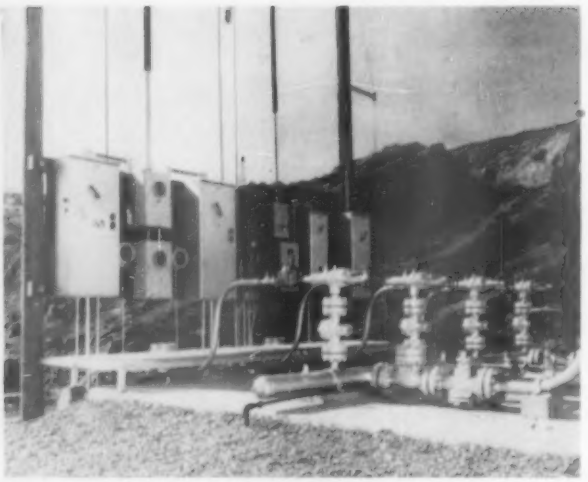
Filtering facilities . . . At the filtering plant the water is received in a 1,000-bbl. all-welded, plastic-lined tank. As at the step tank, a high-level float control acts to shut off the supply of water when the tank is filled.

A 10-hp. motor-driven centrifugal pump takes suction from the tank and moves the water through two Proportioneers cylindrical filters and into a filtered water surge tank. An aqueous slurry of diatomaceous earth is injected into the water at the filter inlet manifold. The filter aid then is removed in the two filters, each of which contains 55 tubes that offer a filtering area of 150 sq. ft.

Both filters operate continuously. Whenever the pressure drop across one becomes too high it is back-washed while the other takes on the entire filtering load.



Water injection is carried out by these two triplex pumps, whose operation is regulated by high and low-level float controls in surge tanks.



Water discharged from pumps enters a manifold from which four lines take off to individual injection wells. Flow meters regulate water to any one well.

The filters likewise continue operation even though no water is being injected or if the water supply is cut off. This continuous operation was deemed desirable to protect the pump and to prevent the builtup filtering surface of diatomaceous earth from sloughing.

This is accomplished by means of a motor-operated three-way valve placed in the inlet line of the surge tank. Whenever the water level inside the tank builds up to 15 ft. a float control operates the valve and causes water to recirculate to the filter. Should the level in the unfiltered water tank for any reason drop to the 3-ft. level, a low-level control likewise will operate the valve to start water circulating.

Injection pumps . . . Filtered water is stored in a 1,000-bbl. surge tank. It, like the raw-water tank, is plastic lined and contains a gas blanket to exclude air.

In addition to the high-level control just described the tank is equipped with float switches which control the operation of the two injection pumps. One pump starts operating whenever the water level builds up to 12 ft. and will continue pumping until the level drops to 6 ft. Float controls for the other pump start it up at the 9-ft. level and stop it when the water drops to the 3-ft. level.

The Aldrich 2¼ by 5-in. direct-flow triplex pumps are equipped with porcelain plungers and driven by 60 hp. 440-volt motors. Operated at 300 r.p.m. they have a combined output of 5,500-bbl. daily with a maximum discharge pressure of 1,650 psi.

The pumps discharge into a manifold from which the individual lines take off to the injection wells. Each line is equipped with a 2-in. adjustable flow bean so that the amount of water directed to a particular well can be varied from zero up to the well's input capacity. Indicating flow meters and pressure gages placed in each line permit all well data to be watched at the plant site.

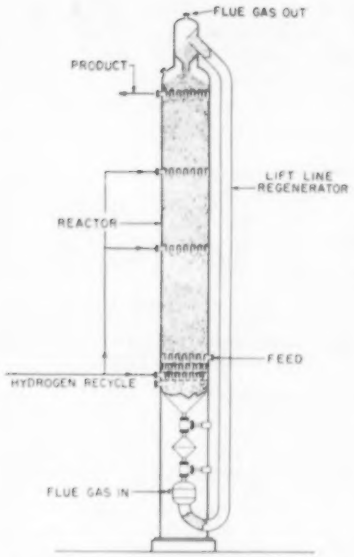
To care for any excess water not run to the input wells, bypass lines equipped with 2-in. adjustable flow beans permit water to be recirculated to the intake header. Desired manifold pressure is maintained by means of a pressure-operated bypass regulator installed in a third line.

By means of this hookup the pumps operate at a steady rate, with any water not needed for injection being recirculated to the intake header. In the event the diaphragm-operated pressure regulator fails to function, mercury-tube pressure switches connected to the discharge line of each pump will act to close them down. And in the event all else fails, pop valves in the discharge lines will operate to discharge the water to a sump.

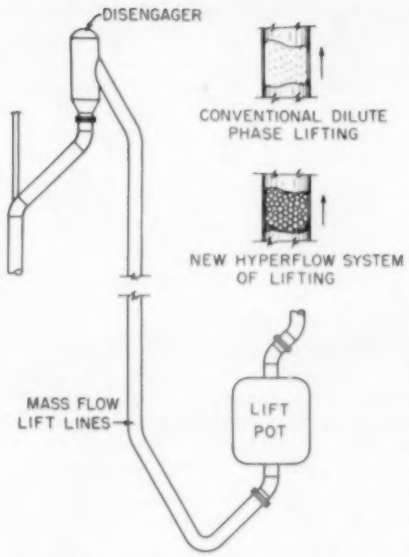
In addition to these controls and safety devices, conventional high-temperature and low oil-pressure switches are used to protect the pumps. Signal lights placed well aboveground enable pumper to see from road whether pumps are operating or shut down.

Another provision included at the plant site is that of injecting tracers into the water input lines. This will permit the pilot flood's progress to be more readily traced after the project is further along.

Panel housing switches, relays, and other electric controls of one injection pump. Robert Jorda, Shell mechanical engineer who assisted in the plant's design, is shown inspecting the controls.



CROSS-SECTION of Hyperformer. Fig. 1.



GENERAL PRINCIPLE of Hyperflow. Fig. 2.

Signal Hill, Calif., plant gets

First Commercial Hyperformer

Operating cost 12 cents per barrel

by Clyde Berg

THE first commercial Hyperforming unit will be put into operation this year at the Signal Hill plant of the Calstate Refining Co. In this application, the plant will process a mixture of thermally cracked and straight-run naphtha over a moving bed of cobalt molybdate catalyst. The mixture will contain approximately 0.6 per cent sulfur. Simultaneous octane improvement and desulfurization will be effected.

These stocks are accommodated with virtually no change in processing from that of the design of a straight-run reforming plant.

Basic operation . . . The Hyperforming process utilizes the general solids-handling techniques developed in commercial operation of the Hypersorption process. The reactor incorporates solids-handling features which provide precise control of catalyst motion at all points. Fig. 1 is a diagram of the basic Hyperforming process.

It will be noted that the catalyst moves downward through the reactor under gravity flow, and is returned back to the top of the reactor by means of mass conveyance in a catalyst-transfer line. Simultaneous with this vertical lift, regeneration is carried out. By the use of continuous regeneration in the course of catalyst movement, a substantial economy in plant construction is effected, and plant maintenance is reduced over that of cyclic processes.

Catalyst transfer . . . A special feature of the Hyperforming process is the use of the Hyperflow lift-line principle to convey the catalyst at very low velocity and minimum attrition loss. The general principle of Hyperflow is illustrated in Fig. 2, which presents a comparison between the new mass-flow method of moving solids and that of dilute-phase technique. The difference in nature of transport of solids by these means is outlined in Table 1.

Upward movement of solids in the Hyperflow catalyst-transfer line is essentially the same as the downward movement of the same material in a gravity-feed line. Movement is slow and steady; there is no turbulence; and the density of the mass is such that the interstices and void volume are the same as in a static bed of the material.

Capital investment . . . Capital investments for Hyperforming are moderate. This is partly because of the low volume of recycle gas circulated, with its attendant reduction in required heat-exchanger, furnace, and compressor facilities. Regeneration facilities are minor. Because of continuous plant operation with uniformly high catalyst activity, recycle gas of constant composition is handled, and gas-handling equipment does not have to be overdesigned to handle offgrade processing conditions such as occur periodically in fixed-bed operations.

Capital investment and initial catalyst costs are given in Table 2.

The charge capacity of the plant is the principal variable which determines the actual magnitude of plant costs. To a lesser degree, cost is affected by sulfur content of the charge stock because this determines alloy requirements.

For additional details on the general aspects of the process, refer to the article, "Hyperforming Makes its Bow," The Oil and Gas Journal, March 23, 1953, pg. 286.

The first commercial Hyperformer, now being constructed at Signal Hill, is designed to produce high-quality Hyperformate for use in motor gasoline. Feed stock consists of a blend of heavy straight-run naphtha obtained in the operations of 2,500-bbl. per day topping and rerun plant, together with heavy thermally cracked naphtha obtained in the viscosity breaking of the residuum produced in the same crude-topping operation.

TABLE 1—THE MASS FLOW OF SOLIDS

Dilute Phase	Mass Flow
1. Solids suspended in gas stream: Apparent density of flowing stream much less than that of gravity-packed solids mass.	1. Solids in compact unfluidized mass: Density of flowing stream substantially the same as a compact downward-moving solids bed.
2. High-gas and solids velocity.	2. Low-gas and solids velocity.
3. Low-pressure differential required.	3. High-pressure differential required.
4. Large quantities of lift gas required.	4. Small quantities of lift gas required.

TABLE 2—HYPERFORMER CAPITAL INVESTMENT CHARGES

	Dollars per barrel of daily capacity
Capital investment	150 to 300
Initial catalyst cost	20

Author associated with Union Oil Co. of California, Wilmington, Calif. Summary of paper presented during midyear meeting, A.P.I. Division of Refining, Houston, 1954.

TABLE 3—HIGH-SULFUR CRACKED STRAIGHT-RUN BLEND FROM LOS ANGELES BASIN CRUDE OIL

Heavy straight-run naphtha, per cent by volume	60
Heavy viscosity-breaker distillate, per cent by volume	40
Gravity, degree A.P.I.	46.3
Engler distillation, degree F.:	
Initial boiling point	241
50 per cent	316
95 per cent point	399
End point	418
Hydrocarbon analysis, per cent by volume:	
Paraffins	29
Olefins	14
Naphthenes	42
Aromatics	15
A.S.T.M. octane rating—D 908, research method:	
Without TEL addition	61.8
With addition of 3 ml. TEL per gal.	73.0
Sulfur, per cent by weight	0.579
Nitrogen, per cent by weight	0.020

TABLE 4—INSPECTIONS OF HYPERFORMATE FROM A HIGH-BOILING HIGH-SULFUR BLEND

	Run "A"	Run "B"	Run "C"
Liquid yield, per cent by volume of C_4+	95.4	93.7	91.3
Gravity of C_4+, degree A.P.I.	48.2	47.1	47.3
Dry gas, standard cu. ft. per bbl.	333	445	613
Butanes, per cent by volume	3.7	5.1	8.8
Polymer, per cent by volume	0.6	0.8	0.9
10-lb.-R.v.p. yield, per cent by volume	104.4	100.7	91.9
Outside butane	9.0	7.0	0.6
A.S.T.M. octane rating (10 lb.-R.v.p.)—D 908, research method:			
Without TEL addition	83.0	87.3	91.5
With addition of 3 ml. TEL per gal.	93.7	96.6	98.9
Sulfur, per cent by weight	0.007	0.007	0.010

TABLE 5—SIGNAL HILL HYPERFORMING-UNIT PRODUCTS

Feed	Barrels for stream day	Thousands of standard cubic feet per day	Gravity (Degree A.P.I.)	Pounds per hour	Liquid yield (per cent by volume)	Yield (per cent by weight)
Naptha	1,000		46.3	12,750	100.0	100.0
Products						
C_5+ gasoline	1,008		48.2	11,560	91.7	90.8
Butanes	40			330	3.7	2.6
Polymer	6.6		24.0	87	0.6	0.6
Make gas*		620		1,282		
Coke†				19.1		0.15
Coke equivalent for oxidation of hydrogen and catalyst				(19.7)		

*Bleed gas and depropanizer overhead gas.
†Combustion products from catalyst regeneration are included in make gas.

The inspections of this feed blend are given in Table 3. Table 4 gives the product distribution in Hyperforming at three levels of severity.

The material balance and product distribution in the operation of this plant are given in Table 5. A yield of 91.7 per cent by volume of C_5+ gasoline is obtained, which blends to a yield of 104.4 per cent by volume of 10-lb.-R.v.p. gasoline, with the addition of 9 per cent outside butanes.

A.S.T.M. octane ratings (D 908, research method) up to a level of 99.0, upon the addition of 3 ml. TEL per gal., could be produced in this plant without production of excess butanes in blending to 10-lb.-R.v.p. gasoline.

Product quality . . . Table 6 gives the qualities of the product which will be obtained in the operation of this Hyperformer. Extensive studies on road-performance and blending qualities of Hyperformate of this general character have shown it to have excellent properties.

A summary of the processing conditions for the Signal Hill Hyperformer is given in Table 7.

Utility requirements . . . Table 8 gives the utility requirements for this plant.

TABLE 6—SIGNAL HILL HYPERFORMING-UNIT DATA ON 10-LB.-R.V.P. GASOLINE

Yield of 10-lb.-R.v.p. gasoline, per cent by volume	104.4
Outside butane	9.0
Gravity, ° A.P.I.	52.8
A.S.T.M. octane ratings:	
D 908, research method:	
Without TEL addition	83.0
With addition of 3 ml. TEL per gal	93.7
Engler distillation, ° F.:	
Initial boiling point	97
10 per cent point	168
50 per cent point	280
90 per cent point	380
95 per cent point	405
End point	427
Sulfur, per cent by weight	0.007

The circulation of catalyst in the Signal Hill Hyperforming unit is very low. Approximately 860 lb. per hour of catalyst will be circulated in this plant, which processes 1,100 bbl. daily of combined feed stock.

Operating costs . . . Estimated operating costs for this plant are given in Table 9. One man with supervision will operate the unit. Net cost of plant operation is less than 12 cents per barrel.

TABLE 7—SIGNAL HILL HYPERFORMER PROCESS CONDITIONS

Reaction conditions	
Temperature, ° F.	870
Naphtha preheat, ° F.	870
Recycle-gas preheat, ° F.	850
Interheater, preheat, ° F.	1,050
Pressure, psig.	400
Space velocity, volume of naphtha per volume of catalyst in the reactor	1.0
Catalyst-to-oil ratio, volume of catalyst circulated per volume of naphtha	0.05
Recycle and interheater gas, standard cubic feet per barrel of naphtha	3,600
Recycle gas (hydrogen content), mole per cent	65
Regeneration conditions	
Average regeneration temperature, ° F.	950
Average pressure, psig.	415
Coke load, per cent by weight of feed	0.15

TABLE 8—SIGNAL HILL HYPERFORMER UTILITY REQUIREMENTS

Fuel gas, 1,000 B.t.u. per hour:	
Produced by unit (710 B.t.u. per standard cubic foot)	18,400
Required by unit for fired heaters	11,350
Net production from unit	7,050
Instrument air, standard cubic foot per minute	45
Cooling water, g.p.m. (38° F. temperature rise)	263
Electrical power, kilowatts:	
Lighting and instruments	25
Pumps and compressors	92
Total	117
Catalyst makeup, pound per stream day	9.0

TABLE 9—ESTIMATED OPERATING COST—1,100-BBL. PER DAY SIGNAL HILL HYPERFORMER

	Cents Per Barrel
Utilities:	
Fuel gas at 16 cents per 1,000 B.t.u.	4.0
Power at 0.7 cent per Kw.-hr.	2.6
Water at 0.078 cent per cu. ft.	0.4
Catalyst at $1.30 per lb. (process guarantees on the order of 3 cents per barrel can be obtained)	1.0
Labor	2.0
Operating supplies	0.2
Maintenance and general overhead	3.5
	13.7
Credit for fuel gas produced at 16 cents per 1,000 B.t.u.	2.7
Net cost (exclusive of royalty)	11.0

Five chief economies of this method

. . . Generally speaking, the economies of the photogrammetric method are primarily realized in the organization, planning, and administration of a pipeline project. Of these, the following are most conspicuous:

1. The detailed route projection is made by competent pipeline engineers in the office, independent of weather conditions and traveling distances. The stereoptical facilities aid in selecting a route requiring a minimum of field revision.

2. The stereocompilation of strip maps prior to field stakeout enables the right-of-way department to begin immediately to procure lands. No wasted effort or time is expended on lands which will not be crossed.

3. Highway, railroad, and river cross-sectioning information may be obtained, permit drawings for such crossings can be completed, and application can be made far in advance of the centerline survey.

4. Ground survey can be accomplished much more efficiently since ingress and egress for survey parties can be obtained in advance, trial survey lines can be eliminated, and all field work can be scheduled during favorable weather without delaying office design or land acquisition.

5. The final maps supplied to the pipeline company contain a wealth of information heretofore not included on the usual pipeline right-of-way maps. This information is not only of great value in the letting of construction contracts, but is also of continuing use through the construction period and is of immeasurable value to maintenance and operating crews for the entire life of the pipeline.

Photogrammetry—And How It Aids In Pipelining

by John H. Mitchell

THE use of maps made from aerial photographs is increasing among pipeline companies in connection with new line construction. Use of such maps results in a minimum of wasted effort on the part of management, land departments, and engineering parties in the planning, purchasing of right-of-way, and surveying for a new pipeline. The completed maps furnish many times the information that would be found on ordinary strip maps made by surface surveys, and serve as a valuable aid in the operation of the line long after construction is over.

Aerial photography . . . The types of aircraft used for aerial mapping vary as widely as do the types of pumps used in the petroleum industry. Flight altitudes currently vary from 1,500 to 30,000 ft. and speeds range from 80 to 380 m.p.h. It is most probable that jet aircraft will soon be entering the and altitudes used in commercial mapping.

The camera carried by the aircraft is a precise photographic surveying instrument with special accessories. It is mounted over the hatch in the bottom of the airplane so it can be turned by the operator to compensate for any crabbing of the aircraft. With his special view finder, the camerman can also determine the time between exposures. The film magazine is mounted on top of the camera and is motor driven. The shutter may be operated either by hand or automatically by means of an intervalometer.

The pattern of successive pictures is always on a straight line. Each successive picture is timed to overlap the preceding one by about 60 per cent. It is this overlapping portion of two pictures which provides stereoscopic coverage.

Measuring and plotting . . . After photographs have been secured, the object which the camera saw in the air is optically reconstructed in the office for the purpose of taking measurements and making maps. Actually, this is one operation since transposition of measurements from the photographs to tracing cloth is done graphically rather than mathematically.

Briefly, the principle of the photogrammetric process is a reversal of the aerial-photography process. Two projectors are used and are oriented so as to be in the same relative positions that the aerial camera occupied at successive exposure points along the line of flight. The overlapping projections intersect in space to form a true-scale, three-dimensional, optical model of the terrain covered. A measuring system is introduced into this model that permits three-dimensional measurements to any feature on the ground and provides semiautomatic means of plotting the results on to paper.

One common photogrammetric plotter is supported on a table a little larger than an office desk. It provides a rigid support over the table for two projectors which project toward the table surface two overlapping aerial photographs. The projections are viewed on a white screen about 4 in. in diameter that is carried on a small movable stand.

To separate the projections for stereoscopic viewing by the operator, one is projected in red light and one in blue-green. The operator wears spectacles that have one red lens and one blue-green. The result is that he sees with one eye the images from one pro-

Author is with Lockwood, Kessler & Bartlett, Inc., Great Neck, N. Y. Digest of a paper presented at Midland, Tex., to the American Society of Civil Engineers, construction division, committee on pipelines, April 9, 1954.

jector, and with the other eye sees the images from the second. The two images then fuse in his mind to create a stereoscopic view.

At the same time, the operator sees in this stereo view a tiny measuring mark on the screen which he can place on the three-dimensional position of any selected image. A vertical scale on the stand permits measurement of height of any image and a pencil lead beneath the mark permits the plotting of the image on the map cloth spread on the table surface.

Maps made by the method outlined can be of great accuracy. For example, the elevation of any point on a map produced from photography taken at an altitude of 5,000 ft. should be accurate within 2 ft. Maps of a scale of 50 ft. to the inch showing 2-ft. contours are very common in photogrammetry.

Photogrammetric mapping cannot be performed without some known distances and elevations within the area photographed. Use of existing quadrangle sheets, railroad plans, pipeline profiles, and the like can often eliminate sending a field party into the area.

Pipeline projects . . . Obviously, before photogrammetric mapping techniques can be applied to the survey of a particular pipeline project, the flight lines for the aircraft must be fairly well defined. This is accomplished by a general route selection, keeping in mind the three prime factors for economical selection. These factors are (1) obtaining the shortest practicable route from end to end, (2) avoiding extreme differences in elevation, and (3) providing access for both construction and maintenance.

A general study is first made from small-scale maps showing large portions of the continent. Here, controlled by such major topographical features as mountain ranges, large bodies of water, cities, and rivers, the general route may be selected. The detailed study of all maps and charts in the vicinity of the contemplated route, combined with field and aerial reconnaissance, narrows and still further confines the general route to a strip perhaps 3 to 5 miles wide.

With the determination of the general route, flight lines may be planned which will give coverage of a 3-mile-wide strip on a 9 by 9-in. photograph taken from 10,000 ft. with a camera having a 6-in. focal length. The altitude of 10,000 ft. and the camera focal length are not necessarily fixed, but that combination does fit equipment which is well suited to pipeline mapping. The projection of such photography results in the compilation of maps having a scale of 1 in. to 1,000 ft.—the optimum scale for most cross-country pipeline maps.

"Maps made by this method can be of great accuracy . . . and a scale of 2 ft. to the inch showing 2-ft. contours are common."

Photograph Not Difficult to Obtain

The securing of aerial photographs is not in itself difficult for an experienced air crew. But unfortunately, the prerequisites of good aerial photographs for mapping make the business one of feast or famine. Primarily, the requirements are that at the time of exposure there be little snow on the ground and that vegetation not be heavily foliated. This means that only a few months in the spring or fall are suitable for mapping.

To compound this difficulty, it should be noted that of the limited months in which pictures may be obtained, there are surprisingly few days with atmospheric conditions which permit good exposures to be made.

Despite the weather and seasonal handicaps, the fact is that photography covering 1,000-mile routes with a strip 3 miles wide may usually be secured in a few good flying days.

Office work . . . With the photography back in the office, real progress can be made toward expediting the pipeline project. Within 24 hours, one set of contact prints is in the hands of the locating engineers, and glass diapositive plates are in the process of being made for insertion in the stereoplotting instruments. With the overlapping set of photos of the entire general route, the location engineers may observe, in a three-dimensional view the entire route by means of a table stereoscope.

For detailed examination of problem areas the engineer has the facility of the stereoplotting instrument. In viewing critical areas by means of this instrument, the engineer sees the problem on a larger scale and more vividly than on photographs. He can accurately determine the relative elevations of features in the area, such as height of river banks or depth of draws.

With the location of the route established at the critical points, the stereoscopic study of the intervening terrain allows the connecting portions of the proposed location to be determined. As the engineer selects the route, he plots it on a set of aerial photographs with a pencil and ruler. The plotted data may then be transferred to any existing maps available. These route sheets can usually be reproduced in short order, and they aid greatly in choosing locations for field offices, delivery points, and stockpiling yards.

At the same time the process of photogrammetric mapping is under way, the proposed route location is very accurately plotted on 1-in. to 1,000-ft. strips maps as they are completed in the stereoplotting instruments. The speed with which these maps can be turned out once again depends on the type of terrain being crossed, the amount of planimetric work in an area, and the quantity of information which it is deemed advisable to depict.

Where there is sufficient existing vertical control, or where it can be economically established, an accurate profile of the selected route can also be extracted from the stereo instruments and placed on the strip map.

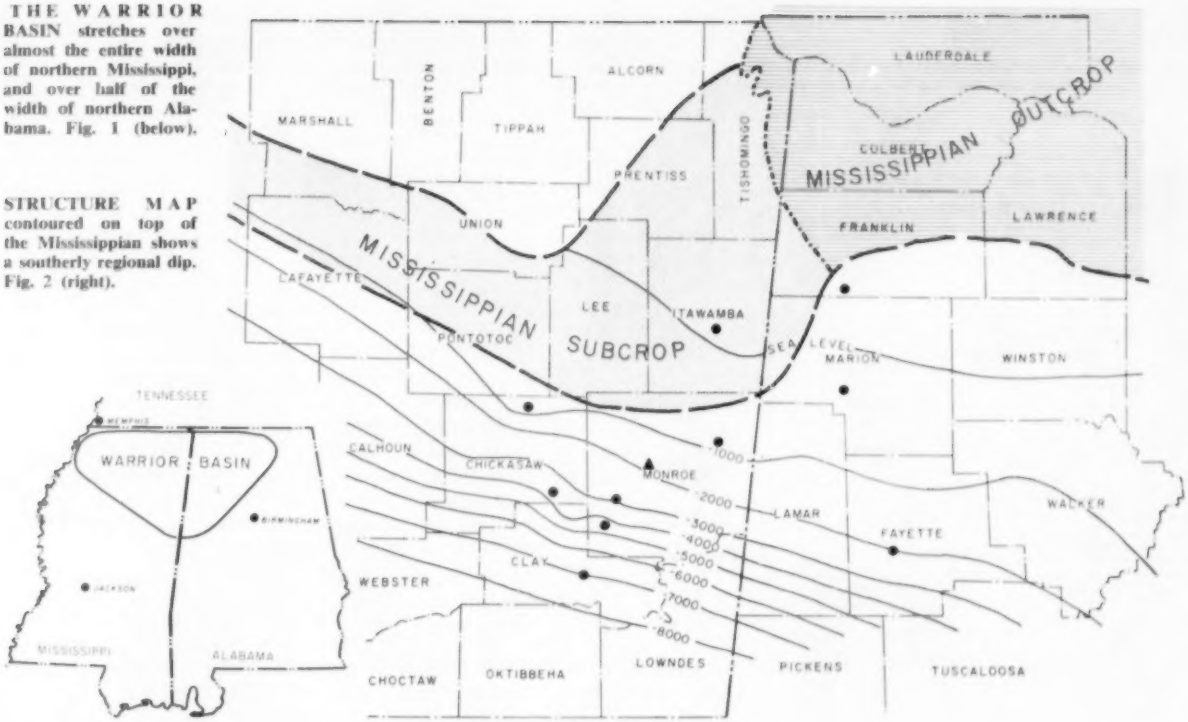
Maps for field forces . . . Since a complete set of strip maps covering the entire route can be had prior to any field survey, all members of the planning and management staff of the project have the advantage of knowing in advance of survey virtually everything they would know after survey. Although no dimensions or angles are noted on the original strip maps, they are accurate enough to enable the scaling of distances and protracting of angles.

The right-of-way department, having been given the photogrammetric maps, is in possession of enough detailed information of the proposed line location that it can proceed to procure easements. The maps materially reduce the usual swath of options and abstracts which heretofore were required to assure legal right-of-way no matter on what properties the surveyors planted their stakes.

The same strip maps are also provided to the field-survey parties primarily as instruction sheets telling them where to stake the line. The field party, however, keeps standard field notes regarding the centerline they stake and when those notes are returned to the office the strip maps are changed from "proposed location" to "as staked." If all goes according to plan, the new line coincides closely with the original proposed line, and the only change in the appearance of the map is the addition of actual field measurements.

THE WARRIOR BASIN stretches over almost the entire width of northern Mississippi, and over half of the width of northern Alabama. Fig. 1 (below).

STRUCTURE MAP contoured on top of the Mississippian shows a southerly regional dip. Fig. 2 (right).



Stratigraphic Problems of Warrior Basin

by Rizer Everett

The author says . . .

The Warrior basin of northeast Mississippi and northwest Alabama has experienced moderate wildcat drilling activity since the completion in February 1952 of the Union Oil Co. 1 Sanders as a commercial gas well. Some of the stratigraphic problems presented include: the lateral gradation of lithology and permeability of Chester sands, the difficulties of correlating the Chester section, and the difficulties of recognizing commercial sands. The solutions to the problems will be worked out as more data are obtained from the newly discovered gas fields and more wildcats are drilled in the basin.

FROM the completion date in February 1952 of the Union Oil Co. 1 Sanders to April 1954, 51 new-field wildcats were drilled in the Warrior basin (Fig. 1) of Mississippi and Alabama. Seven of these wildcats were completed as shut-in gas or gas-condensate wells, and one was completed as an oil well. Of the eight new-field wildcats drilling April 1, 1954, one will probably be a new-field discovery.

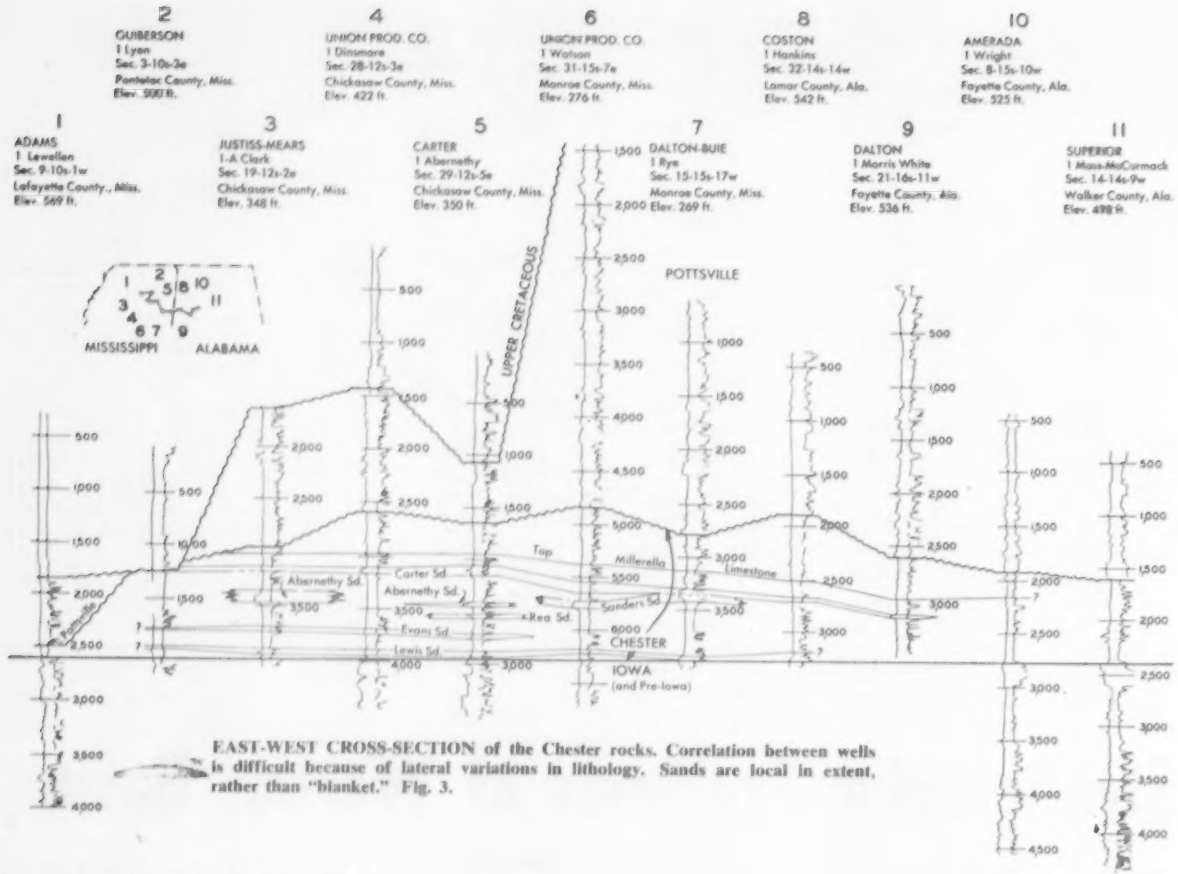
Regional structure . . . The structure of the area is complex with many anticlines, some of which are faulted. A regional structure map of the Mississippian (Fig. 2) based on subsurface data only does not reveal the complexity of the structure, but it does show the direction of regional dip. Since most of the new gas fields in the Warrior basin are located on seismic structures, it is apparent that structure is an important factor controlling accumulation.

However, this article will deal mainly with the stratigraphy of the Chester series in an effort to present certain stratigraphic problems of the basin. A discussion of the entire sedimentary section of the Warrior basin along with an explanation of the structural picture of the basin as we now know it was given by Mellen[1] in his two-part article published last summer.

Correlation of subsurface to Illinois section . . . In the fall of 1952 when the Paleozoic study group of the Mississippi Geological Society began its work on the Chester of the Warrior basin an effort was made to correlate the Chester with the standard Illinois Section. However, no agreement could be reached among the study group members, and the matter was dropped. It was generally agreed, nevertheless, that no sediments of post-Elvira and upper Elvira age are present in the most complete section of the Chester known in the Warrior basin. The correlation shown here (Fig. 4) does not represent the opinion of even a majority of the Paleozoic study group, but it does show a possible correlation based on our present knowledge. It may be altered in the future when more data are available.

The absence of limes in the Warrior Basin Chester subsurface section makes the correlation with the standard section very difficult.

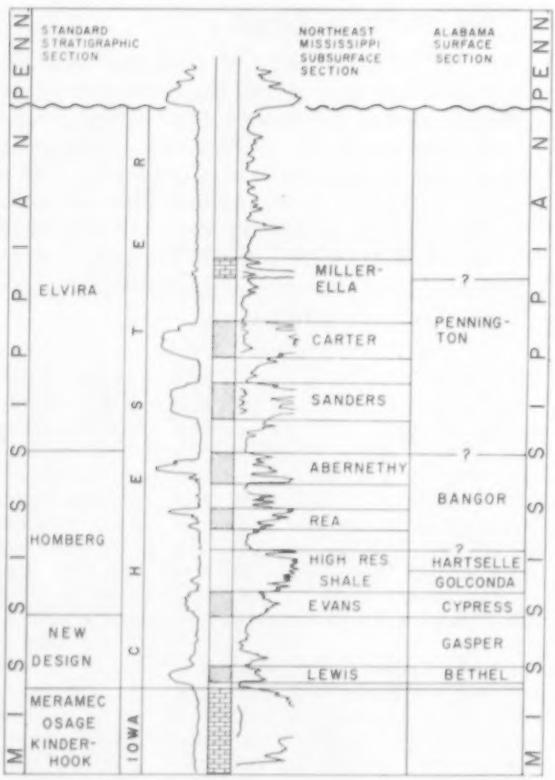
Chester outcrops . . . Where the Chester rocks outcrop in Northwest Alabama there is considerably more limestone present than in the Chester of the subsurface in Northwest Mississippi. The



EAST-WEST CROSS-SECTION of the Chester rocks. Correlation between wells is difficult because of lateral variations in lithology. Sands are local in extent, rather than "blanket." Fig. 3.

lateral gradation of rocks from limestones at the surface to sands and shales in the subsurface in less than 80 miles makes it extremely difficult to be certain of the correlation of the surface Chester beds with those of the subsurface. Because of these difficulties of correlation the Paleozoic study group of the Mississippi Geological Society named the Chester sands shown in Fig. 4 by using the farm names of the wells in which the sands were first productive or well developed. Up to the present time six sand names have been adopted for use by the society (Figs. 3 and 4).

Limited fossil evidence . . . Even though a number of wells have cored a great deal of the Chester section in Northeast Mississippi, there is at present insufficient fossil information to permit the



COMPOSITE LOG of Mississippian formations in Warrior basin, showing best possible correlation, on present information, with standard section and Alabama surface section. Fig. 4.

THE AUTHOR

Rizer Everett is district geologist for Carter Oil Co. at Jackson, Miss., in charge of Mississippi and Alabama. He is a graduate of University of Texas, and has been with Carter since 1937, having served that company in Kansas, Oklahoma, Kentucky, Illinois, Indiana, and Wyoming prior to his present assignment. The original version of his paper, "Certain Stratigraphic Problems in the Black Warrior Basin," was presented at the third annual meeting of the Gulf Coast Association of Geological Societies in Shreveport, La., in October 1953.

determination of formations or even groups of the Chester series. Guide fossils used in establishing formation boundaries in the region of the Standard Chester section have been rarely observed in cores, and the fossil fragments found in the cuttings are too badly damaged to permit positive identification. With the drilling of additional wells and with the compiling of additional data from future cores of Chester formations there will undoubtedly be better delineation of groups and formations within the Chester series. Geologists of the USGS are now making detailed studies of the fossils found in cores of Warrior basin wells, and it is hoped that the results of their work will aid in defining the group and formation boundaries within the Chester.

Lateral gradation of producing zones . . . Part of the difficulty of making precise correlations of the subsurface Chester section with the standard section and with the Alabama surface section is because of the rapid lateral gradation of well developed sandstones into shales and limestones. These gradations make it difficult to correlate wells, and they are evidence of the absence of sheet sands in the Warrior basin. While an absence of sheet sands may not adversely affect the accumulation of oil and gas in the basin it does make the search for oil traps more difficult.

In addition to the loss of potential oil and gas reservoirs because of lateral gradations of lithology in the Warrior basin there is a loss of reservoirs due to rapid lateral change in porosities and permeabilities. In Muldon field where wells are drilled on 320-acre tracts the permeability of the Carter sand has ranged from a few millidarcies in one well to several hundred millidarcies in another well. Since many of the Chester sands have been found to be too tight to produce even though oil stains have been present, it is obvious that future producers will be located where favorable porosities and permeabilities are present. It is quite possible that wells which encounter the most favorable porosities and permeabilities in Chester sands will not be located on the highest parts of the producing structures.

Oil staining in cores . . . Up to the present time no commercial oil production has been found in Chester sands of the Warrior basin. Many cores of Chester sands have been heavily oil stained, but the only liquid hydrocarbons yet produced have been as condensate along with the gas. Since all the presently producing gas fields are on closed structures, it is possible that oil will be found on the flanks of the structures as the fields are developed.

Chester sands and limes at the outcrops in several places in the Warrior basin contain asphalt, and it is undoubtedly because of these oil seeps that a number of the wildcat wells were drilled in the basin in the early part of the century. Many of the wells in the Warrior basin have asphaltic shows of oil in Chester sands, but it was not until the Union 1 Sanders was completed as a commercial gas well that it was learned that these sands could produce large gas volumes.

Gas discovery . . . Upon completion of the 1 Sanders operators began making open-hole drill-stem tests of all sands with asphaltic shows. None of the tests yielded gas volumes equal to the 1 Sanders calculated open flow of 35,000,000 cu. ft. per day. However, one well, Carter 1 Baskin heirs, was completed for a calculated open flow of 36,000,000 cu. ft. per day after a fracture treatment of the sand that had previously flowed gas at the rate of 150,000 cu. ft. per day. Subsequent efforts in other wells to increase gas production by hydraulic stimulation of tight sands indicate that some of the Chester sands with asphaltic shows are too tight to produce oil in commercial quantities in spite of fracture treatments. Therefore, it will be necessary to continue to core and drill-stem test Chester sands in wildcats in order to obtain additional information about the fluid content of the reservoirs. Based on this additional information operators will be better able to distinguish between commercial and noncommercial shows of oil and gas.

Conclusions

None of the new gas fields in the Warrior basin have yet produced sufficient quantities of gas to permit accurate ultimate recovery predictions based on decline curves. Since there will be a demand for gas in the Warrior basin, high prices will probably be paid for the gas; these high prices will tend to offset the high drilling costs for penetrating hard Paleozoic rocks. Costs in drilling will continue to decline as operators gain more experience in improving the rates of penetrating the hard, quartzitic sandstones of the Pennsylvanian and Mississippian formations.

Acknowledgment

The writer wishes to thank members of the staff of the Jackson office of Carter Oil Co., for their help in preparing this paper. Appreciation is expressed to the Mississippi Geological Society for permission to reproduce the cross-sections shown.

Reference

1. Frederic F. Mellen, "Geology of the Black Warrior Basin," World Oil, June and July 1953, Vols. 136 and 137.

BOOKS

THREE STARS FOR THE COLONEL, a biography of Lt. Gen. Ernest O. Thompson. By James A. Clark. Published by Random House, 457 Madison Avenue, New York. 265 pp., $4.

The date was October 3, 1930. It was an epochal day in oil history, the day when a 70-year-old wildcatter named Dad Joiner brought in the discovery well of fabulous East Texas field—3 Daisy Bradford. This discovery, and the amazing oil boom it generated, in 14 months transformed the dusty farmlands of East Texas into a jungle of oil rigs. It unleashed a flood of petroleum that first enriched, then threatened to destroy, the young American oil industry.

The closing months of 1931 brought the crisis to a head. The staggering output of East Texas field had glutted the market with as much as a million barrels of oil a day. Oil prices had plummeted down from $1.10 a barrel in 1930 to 10 cents a barrel in late 1931. East Texas oil men, oblivious to future needs and blinded by the sight of a seemingly endless flood of oil, increased production again and again in a futile attempt to gain through volume the revenue lost through falling prices. All legislative and government attempts to stem the cascade of oil had failed, the chaos gripped the industry.

That was the picture when Ernest O. Thompson, newly appointed member of the Texas Railroad Commission, was charged by Gov. Ross Sterling with the job of ending the East Texas debacle and bringing order and conservation to Texas oil development. How Thompson did that job—and more—is detailed in this biography. And the result, in the words of the author, was this:

"For the first time in history, it seemed that the boom and bust days, the days of feast and famine in the oil industry, were over . . . East Texas was the turning point, and Ernest Thompson was its guiding star."

East Texas certainly was a turning point in the history of oil production—and it was equally significant in the life history of Ernest O. Thompson. It brought him into the oil industry, marked him as one of its leaders, and set the stage for a record of achievement that has earned him the title of "Father of Petroleum Conservation."

Yet until his appointment to the Texas Railroad Commission in 1931, the oil industry was of little concern to Ernest Thompson. Born in 1892 in Alford, Tex., he was the son of a druggist who moved his family to Amarillo near the turn of the century.

It was in Amarillo that Ernest Thompson first made his mark in adult business affairs by successfully operating an automobile dealership while still in his teens. And it was there—after Army service in World War I in which he rose through the ranks to become a lieutenant colonel and after earning his law degree at University of Texas—that he settled down to practicing law.

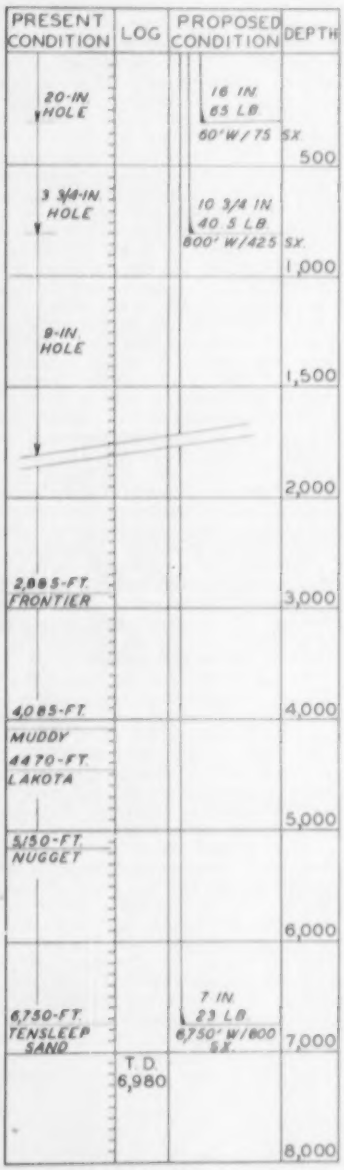
After a brief career that combined law and hotel management, Thompson entered politics in the race for mayor of Amarillo. His success as Amarillo's mayor and his reputation for honesty and legal ability led to his appointment to the Railroad Commission and his contact with the oil industry.

Ernest Thompson's first achievement on behalf of the oil industry—stemming the wasteful flow of East Texas oil—was done with the characteristic intelligence, courage, and foresight that marked his many other achievements that followed.

"Three Stars for the Colonel" is a colorful, competent biography of citizen-soldier Ernest Thompson. It traces his career from boyhood to the present time, and in doing so presents a vivid picture of a remarkable man whose imprint on America's petroleum industry is enduring and highly significant.

Here's How British-American

Drilling an expensive deep test? Are your plans set up in advance? Do your field men know, in written form, just what is expected, step by step? To illustrate how one company proceeds, here is the type of form, or chart, that British-American Oil Producing Co., Dallas, uses for its drilling wells. Each step of work and every



PROGNOSIS

A.F.E. NO. 198

STATE: Wyoming
DISTRICT: Northwest
FIELD: Louis Field
WELL: May No. 1
LOCATION DESCRIPTION: 320 ft. from north line and 324 ft. from west line of NW¼ SW¼ 9-10n-3w, Park County, Wyoming
ELEVATION: 5,000 ft. ground level est.

DATE: Dec. 6, 1953
COUNTY: Park

PROGRAMS

To drill and complete subject well in the Tensleep sand to a minus 1,300 ft.

CONDUCTOR CASING: 16-in. 62.58-lb. F-25 set at approximately 60 ft. and cemented with 75 sacks common cement. Circulate cement to ground surface. WOC 36 hours.

SURFACE CASING: 10¾-in. 40.5-lb. T. & C. Run a float guide shoe and set casing at approximately 800 ft. Cement with 425 sacks; circulate cement to surface and squeeze excess into formation. WOC time 48 hours.

PRODUCTION STRING CASING: 7-in. 23-lb. N-80 casing. Cement conventionally with 800 sacks, using 3 per cent Aquagel mix for the first 500 sacks. The structural position of the Frontier series will determine whether it will be desirable to run a stage cementing collar in the 7-in. oil string casing at a point below the base of the fourth Frontier for the purpose of covering the Frontier series with a protective sheath of cement.

CORING AND TESTING: Core and/or drill-stem test significant shows in the Lakota sands if samples and drilling time indicate it is feasible.

CORE ANALYSES: All cores should be laboratory analyzed.

ELECTRIC LOGGING: Run an electric log on the surface hole with a view toward obtaining information relative to the main NW-SE fault defining the western productive limits of the field.

Tail electric log to ultimate total depth and run MicroLog through Dinwoody-Phosphoria sections.

DRIFT SURVEYS: Run Totco or Eastman straight-hole tests every other joint (60 ft.) in the surface pilot hole and at 250-ft. intervals in the reamed surface hole. Thereafter at 100-ft. intervals from surface casing seat to total depth.

Plans Deep Wells

item are studied and checked in advance. Final plan is approved, copies transmitted to all employes concerned.

RESULT: Field responsibility is fixed, plans are definite and certain, no time is lost by coping with unlooked-for events or unforeseen needs.

DRILLING TIME AND SAMPLES: Run Geolograph for record of drilling time. Sample interval in accordance with instructions from geologists.

DEPTH MEASUREMENTS: Check well depths by steel-line measure of drill pipe at tops of potential pay formations, at all casing points, and at total depth of well. Run Schlumberger Photoclinometer to total depth before setting oil string casing.

COMPLETIONS: Drill 9-in. hole with rotary tools far enough into Tensleep formation to get a pick on the electric log. Run Schlumberger electric log. Run 7-in. oil string casing; set and cement casing on top of the Tensleep sand using a packoff-type shoe if significant formation is exposed below casing. Lay down 4½-in. drill pipe, pick up 2½-in. EUE tubing as drill pipe and drill baffle collar, cement and shoe. Change from conventional mud to field crude. Diamond core with 6⅛-in. head to minus 1,300 ft. If core-analysis data indicate significant midsection water, set a 5½-in. o.d. 15.5-lb. liner to total depth, cement and selectively perforate for production. Move in B-A Cardwell, swab well through 7-in. casing and run production tubing string with Guiberson Type "E" tubing catcher and slotted mud anchor. Run rods and 2½-in. TLE pump.

SURFACE EQUIPMENT:

Pumping Unit: Suitable make with 28,000-lb. beam capacity 320,000-in.-lb. gear box and 74-in. maximum stroke.

Engine: 2-cylinder slow-speed with approximately 50 hp.

Derrick: 129-ft. steel derrick equipped with rod hanger and safety cage. (On hand). The design of the proposed 7-in. o.d. oil string casing is as follows: (from bottom to top). The design of this string has been influenced by availability of the casing.

Joints	Description	Footage
1	Shoe (packoff type if setting on top of significant open section)	2.00
2	23-lb. N-80, S.S. Long T. & C. Casing	62.00
1	Baffle collar	1.00
219	23-lb. N-80 S.S. Long T. & C. Casing	6,685.00
	Total	6,750.00

Note: It is proposed to use a sodium-base drilling mud with a supersaturation of calcium. Such a mud would drill the anhydrite sections without the addition of anhydrox and permit a one-run Schlumberger electric log. (It was formerly considered necessary to make one Schlumberger run to the base of the Lakota sand to get a significant electric log evaluation of the green oil sands prior to adding anhydrox to the drilling fluid. A second-run electric log was ultimately "tailed" to total depth.)

? ? Do you know how to figure

When Pressure Maintenance Pays Off

by Charles J. Deegan

WHEN operators take oil and gas out of a reservoir, they empty a certain number of cubic feet of pore space in the rock. To maintain reservoir pressure they must put back enough water or gas or both to fill the same number of cubic feet of reservoir pore space—at the same pressure. The number of cubic feet of pore space they empty each day determines the volume of water or gas or both that they have to put back into the reservoir.

The more water or gas or both that they put back into the reservoir each day, the more oil and gas they can take out each day without any drop in pressure. The less water or gas or both that they put back each day, the less oil and gas they can take out.

The economic result of any given rate of input and takeout is reflected swiftly and accurately in the market value of a property. The market value of any fully developed oil property is simply the capitalized value of the future cash income. The capital value of future cash income depends on how much of it is received in each future year and the rate of interest that investors think an investment in oil should return. Currently the investors are asking for about 10 per cent per annum net on direct oil investments.

It cost the operators money to put water or gas or both back into the reservoir rock. The larger the volume per day put back in, the larger the initial capital investment for input equipment and the higher the total daily operating costs for the system.

It also costs the operators money,

Author is a petroleum consultant in Dallas.

Here's how a small operator might compare investments in a purely theoretical project, where there are two alternative proposals

MEMORANDUM

TO—President—XYZ Oil Co.—Office.
FROM—Petroleum Engineer.
SUBJECT—Proposed ZEBRA Pressure-Maintenance Unit—Alternative Proposals.

The Engineering Committee has submitted two tentative alternative proposals to the various engineers for operators in the unit. These are actually feelers to get the reactions of the majority of the operators. I have summarized these two proposals below; analyzed them to show the results; and recommended action to be taken.

SUMMARY OF PROPOSAL NO. 1

XYZ's share of investment proposed is $50,000; its share of reserve is estimated at 500,000 bbl. primary recovery, to be increased to 1,000,000 bbl. under unitized pressure maintenance. Investment in pumps, compressors, etc., kept at minimum possible. Result of course is slow recovery of oil. Producing life estimated at about 43 years.

SUMMARY OF PROPOSAL NO. 2

XYZ's share of investment proposed is $205,000; its share of reserve is estimated at 500,000 bbl. primary recovery; to be increased to 850,000 bbl. under unitized pressure maintenance. Investment in pumps, compressors, etc., based on large injection capacity in order to get faster recovery of oil. Producing life estimated about 25 to 30 years.

ANALYSIS OF PROPOSAL NO. 1
(For detailed calculations, see Tables 1 and 2 in Appendix)

OUR RESERVES—To be increased from 500,000 bbl. primary to 1,000,000 bbl. under unitized pressure maintenance.

INVESTMENT PROPOSED—$50,000 as XYZ's share. This equals 10 cents per barrel on the 500,000-bbl. increase over primary recovery, or 5 cents per barrel on the 1,000,000-bbl. total.

TIME ELEMENT—Produce at steady rate for 25 years (XYZ's share 30,000 bbl. per year) then normal decline to economic limit at about 43 years.

MARKET VALUE RESULT—The market value of our share of the unit would be $490,000 or $0.49 per barrel on the 1,000,000-bbl. reserve. (See Tables 1 and 2 in Appendix for detailed figures.)

CONCLUSION—Primary production in this area is selling at $0.80 to $0.90 per barrel of proven reserve. Therefore the market value of $0.49 per barrel for the proposed Zebra Unit under Case No. 1 indicates the project is undercapitalized, and the result is a low production rate.

RECOMMENDATION—Turn down Proposal No. 1 in most emphatic words possible in a polite letter. Privately and verbally make it even stronger.

ANALYSIS OF PROPOSAL NO. 2

(For detailed calculations, see Tables 1 and 3 in Appendix)

OUR RESERVES—To be increased from 500,000 bbl. primary to 850,000 bbl. under unitized pressure maintenance.

INVESTMENT PROPOSED—$205,000 as XYZ's share. This equals 58 cents per barrel on the 350,000-bbl. increase over primary recovery; or 24 cents per barrel on the 850,000-bbl. total.

TIME ELEMENT—Double production rate of Case No. 1 for first 10 years (XYZ's share 60,000 bbl. per year), rapid decline to about one-fourth that rate in fifteenth year, then slower decline to economic limit at about twenty-fifth to thirtieth year.

MARKET VALUE RESULT—The market value of our share of the unit would be $771,000, or $0.90 per barrel on the 850,000 bbl. total reserve. (See Tables 1 and 3 in Appendix for detailed figures.)

CONCLUSION—At $0.91 per barrel, the market value of the unitized reserves are about in line with the market value of primary reserves in this district, perhaps a bit high. This indicates that the proposed $205,000 investment in Case No. 2 is much closer to the point of maximum profit than the $50,000 investment proposed in Case No. 1. The following tabulation shows the comparative results for XYZ Oil Co.:

Case—	Market value 500,000 bbl. primary reserve	Proposed investment	Total	Market value unitized reserve	Gain or loss
No. 1	*$400,000	$50,000	$450,000	$490,000	$40,000
No. 2	*400,000	205,000	605,000	771,000	166,000
No. 1	†$450,000	$50,000	$500,000	$490,000	$10,000
No. 2	†450,000	205,000	655,000	771,000	116,000

*Primary reserves at $0.80 per barrel. †Primary reserves at $0.90 per barrel.

With a $50,000 investment, we would gain at best $40,000; we might wind up $10,000 in the red, depending on whether you figure our primary reserves are worth $0.80 per barrel or $0.90 per barrel. On the $205,000 investment, we are $126,000 better off at either value on primary reserves. We either gain $116,000 instead of losing $10,000; or we gain $166,000 instead of $40,000.

Checked with the oil-loan departments of both bank and insurance company. Bank said it would lend us about $225,000 on our property under Case No. 1 ($50,000 investment); and about $425,000, perhaps $450,000, under Case No. 2. Insurance company said it would go to about $300,000 under Case No. 1, and perhaps to $550,000 under Case No. 2. Both want $1.80 per net barrel pledged against the loan, or about 75 per cent of net operating profit before federal income tax. Bank loan will pay off in about 5 years; insurance company loan in about 7 years.

RECOMMENDATION

I propose we suggest to the Engineering Committee that as a final check, they figure two more alternative cases, using total investment figures for pumps, compressors, etc., which would bring XYZ's share to about $150,000 and $175,000; letting the production rates and reserve figures fall where they will. Then every operator can figure out his resulting production rates and market values per the form in Tables 2 and 3 of the Appendix. That should just about bracket the target of maximum-profit investment and show all of us pretty conclusively what is the soundest economic production rate.

APPENDIX — TABLE 1
NET CASH REALIZATION PER BARREL FROM PROPOSED ZEBRA UNIT PRODUCTION

	Case No. 1		Case No. 2	
Gross income (oil and gas)		$2.90		$2.90
Operating expenses	$0.25		$0.25	
Severance and ad valorem taxes	0.25		0.25	
Federal income taxes*	0.75		0.65	
Total cash expenses	$1.25	1.25	$1.15	1.15
Total cash return to XYZ Oil Co.		$1.65		$1.75

*INCOME-TAX CALCULATIONS

	Case No. 1		Case No. 2	
Gross income		$2.90		$2.90
Tax deductions:				
Depletion at 27.5 per cent of gross	$0.80		$0.80	
Depreciation	†0.10		‡0.30	
Other taxes	0.25		0.25	
Operating expenses	0.25		0.25	
Total deductions	$1.40	1.40	$1.60	1.60
Taxable income		$1.50		$1.30
Income tax at 50 per cent rate		$0.75		$0.65

†$0.05 on undepreciated balance of original development equipment, plus $0.05 for pressure-maintenance equipment investment.

‡$0.06 on undepreciated balance of original development equipment, plus $0.24 for pressure-maintenance equipment investment.

APPENDIX — TABLE 2
MARKET VALUE OF XYZ'S PROPERTY UNDER CASE NO. 1

Year	Bbl. oil produced	Discounted market value of $1.65 per bbl. cash return*	Accumulated bbl. oil produced to end of each year	Average market value per bbl. for accumulated oil to this date
1	30,000	$1.57	30,000	$1.57
2	30,000	1.43	60,000	1.50
3	30,000	1.30	90,000	1.43
4	30,000	1.18	120,000	1.37
5	30,000	1.07	150,000	1.31
6	30,000	0.98	180,000	1.25
7	30,000	0.89	210,000	1.20
8	30,000	0.81	240,000	1.15
9	30,000	0.73	270,000	1.11
10	30,000	0.67	300,000	1.06
11	30,000	0.61	330,000	1.02
12	30,000	0.55	360,000	0.98
13	30,000	0.50	390,000	0.95
14	30,000	0.46	420,000	0.91
15	30,000	0.41	450,000	0.88
16	30,000	0.38	480,000	0.85
17	30,000	0.34	510,000	0.82
18	30,000	0.31	540,000	0.79
19	30,000	0.28	570,000	0.76
20	30,000	0.26	600,000	0.74
21	30,000	0.23	630,000	0.71
22	30,000	0.21	660,000	0.69
23	30,000	0.19	690,000	0.67
24	30,000	0.18	720,000	0.65
25	30,000	0.16	750,000	0.63
After 25th	250,000	†0.08	1,000,000	0.49
	1,000,000	Ave. $0.49		

*Discounted to value which at 10 per cent per annum will yield $1.65. Receipt of income in monthly installments compensated for by assuming total yearly income received at midyear for purposes of computing discount.

†Value in twenty-sixth year would be about 14 cents; value at end about 1 cent; averaged and estimated 8 cents about right.

APPENDIX — TABLE 3
MARKET VALUE OF XYZ'S PROPERTY UNDER CASE NO. 2

Year	Bbl. oil produced	Discounted market value of $1.75 per bbl. cash return*	Accumulated bbl. oil produced to end of each year	Average market value per bbl. for accumulated oil to this date
1	60,000	$1.67	60,000	$1.67
2	60,000	1.51	120,000	1.59
3	60,000	1.34	180,000	1.51
4	60,000	1.25	240,000	1.44
5	60,000	1.14	300,000	1.38
6	60,000	1.03	360,000	1.32
7	60,000	0.94	420,000	1.27
8	60,000	0.86	480,000	1.22
9	60,000	0.78	540,000	1.17
10	60,000	0.71	600,000	1.12
11	40,000	0.64	640,000	1.09
12	30,000	0.58	670,000	1.06
13	20,000	0.53	690,000	1.05
14	15,000	0.48	705,000	1.03
15	15,000	0.44	720,000	1.02
After 15th	130,000	†0.25	850,000	0.91
	850,000	Ave. $0.91		

*Discounted to value which at 10 per cent per annum will yield $1.75. Receipt of income in monthly installments compensated for by assuming total yearly income received at midyear for purposes of computing discount.

†Value in sixteenth year would be about 40 cents; value at end about 10 cents; averaged and estimated 25 cents about right.

Pressure Maintenance Is Paying Off at These Installations . . .

THIS GAS INPUT WELL is typical of those used on University of Texas lands in West Texas Block 31 by Atlantic Refining Co.

and a lot of money, if the oil and gas are withdrawn from the reservoir rock too slowly. Postponing the receipt of oil and gas income causes its present market value (or capitalized future income) to shrink very rapidly.

The economic principle involved is just the same as in any other business problem. What size capital investment in equipment and material to fill empty reservoir-rock pore spaces will net the most profit, profit being figured as the present market value of future income?

Like any other business project, the capital investment for any given pressure-maintenance project can be too low, too high, or about right. There is a need for a rule of thumb that will give a quick preliminary check on proposed pressure-maintenance investments, so that busy executives can screen various proposals quickly and decide which ones merit more detailed checking.

The following rule of thumb seems reasonable for this purpose:

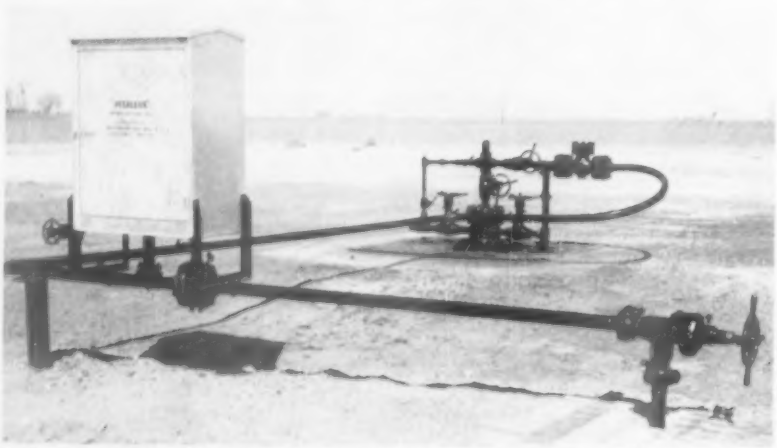
1. If the market value per barrel of total proven reserves is substantially lower in the pressure-maintenance-unitized project than in primary producing properties in the same district, then the project is probably undercapitalized; proposed investment may be too low.

2. If the market value per barrel of total proved reserves is substantially higher in the unit than in primary producing properties in the same district, then the project is probably overcapitalized; the proposed investment may be too large.

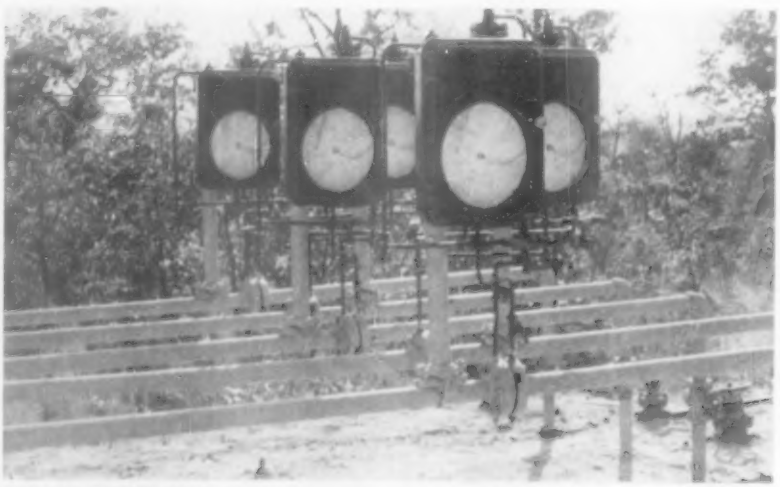
3. If the market value per barrel of total proved reserves is about the same in the unit as in primary producing properties in the same district, the investment is probably about right.

This quick check is based on the idea that the proper investment in pressure maintenance should develop proved reserves with a market value per barrel at least equal to similar reserves developed by drilling proved locations. Operators and executives are on familiar ground when the financial results of a proposed pressure-maintenance project can be compared directly with the financial results from development drilling in a similar area. They can make decisions about the proper capital investment with more assurance.

The accompanying example shows how a small operator, XYZ Oil Co., might compare the investments in a purely theoretical project, where there are two alternative proposals.



ONE OF 12 INPUT WELLS used in the gas-injection program by Stanolind Oil & Gas Co. on the Anton-Irish Unit in West Texas.



TYPICAL METER INSTALLATION used on gas-repressuring units in the Seminole-Wewoka-Holdenville, Oklahoma, area.

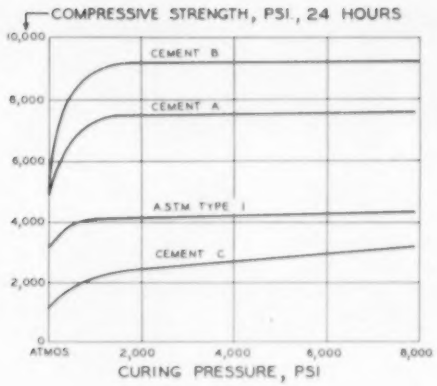


Fig. 1—Curing pressure vs. compressive strength of neat cement at age of 24 hours.

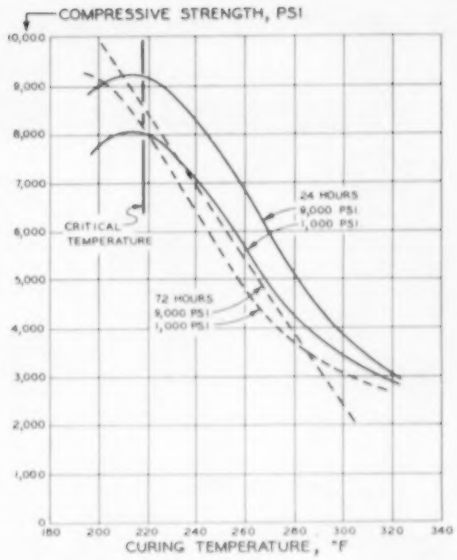


Fig. 2—Slow-set cement A. Compressive strength vs. curing temperature at 1,000 and 9,000 psi.

A.P.I. Study Focused on

Effect of High Temperatures And Pressures on Cements

A NEW test procedure for oil-well cements has been developed to furnish a more realistic evaluation of actual in-the-well performance. Oil-well cements suffer severe losses in early strength where cured at temperatures above 220° F. it is found by the American Petroleum Institute's Mid-Continent Study Committee on Cementing Practices and Testing of Oil Well Cements. In view of the loss, the group proposes a well-simulation cement-curing test as a satisfactory method of evaluating cement strength.

by M. A. Swayze

EXTENSIVE study of the effects on oil well cements of different pressures and temperatures has yielded the data used to plot Figs. 1 through 5. These data indicate that as a class the slow-set cements (A, B, and C) experience a marked decrease in 24-hour strength at curing temperatures in excess of 220° to 240° F., and that this decrease is still being felt after 3 days' (72 hours') curing time.

In most cases an actual retrogression in strength occurred between the two test periods. The same general phenomenon was noted for A.S.T.M. Type I cement (Fig. 5) except that the lowering of strength began at lower temperatures; for example, 220° F. for the 24-hour tests and less than 200° F. for the 72-hour tests.

Author is with Lone Star Cement Corp., New York. Paper presents work by the Mid-Continent District Study Committee on Cementing Practices and Testing of Oil Well Cements, A.P.I., and presented at Mid-Continent District meeting, Oklahoma City, March 18, 1953.

2,000 Psi. high enough . . . The results of these two series of tests definitely established that curing pressures in excess of 2,000 psi. would not be necessary but that curing temperature actually simulating bottom-hole cementing and curing conditions must be imposed on the cement if accurate cement strengths are to be known.

Heating rate important . . . Investigation also revealed that heating rate markedly affects cement strength. In every instance the lower the heating rate used for a given temperature, the higher the 24-hour strength development.

Rate of heating had less effect when the final temperature was less than 240° F.—having a major effect in the 280° F. range and only a slight effect in the 320° F. range. This indicates that there is a critical temperature that materially affects cement strength.

Cooling rates had little or no effect on the strength of the test specimens.

The curing schedules in Table I were followed for several correlative tests on split samples of cements, with satisfactory results obtained. On the basis of these correlative tests, the well-simulation tests for curing cements presented in Table I were accepted as a satisfactory method of evaluating oil-well cement-strength development.

Well conditions . . . The severe loss of

TABLE 1—WELL-SIMULATION TEST CONDITIONS FOR CURING STRENGTH SPECIMENS

Strength schedule No.	Depth, ft.	Temp. at end of given time after starting test, hours* ½	¾	1	1¼	1½	2	2½	3	3½	4
1S	1,000	80	81	82	83	84	86	88	90	92	95
2S	2,000	90	91	92	93	94	96	99	102	106	110
3S	4,000	100	105	109	113	117	121	125	130	135	140
4S	6,000	100	115	120	124	128	136	144	152	160	170
5S	8,000	105	115	130	140	150	160	170	180	190	200
6S	10,000	110	125	140	150	155	170	185	200	215	230
7S	12,000	115	135	155	175	185	200	215	230	245	260
8S	14,000	125	150	170	195	215	230	245	260	275	290
9S	16,000	135	165	190	220	245	260	275	290	305	320
10S	18,000	145	180	210	245	280	305	315	325	335	350

*Pressure of 2,000-4,000 psi. applied as soon as specimens are placed in chamber and maintained throughout test. Final temperature ±2° F. maintained to completion of test.

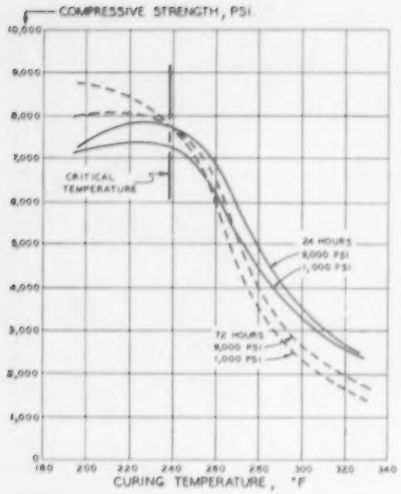

COMPRESSIVE STRENGTH, PSI
CRITICAL TEMPERATURE
24 HOURS 9,000 PSI 1,000 PSI
72 HOURS 9,000 PSI 1,000 PSI
CURING TEMPERATURE, °F

Fig. 3—Slow-set cement B. Compressive strength vs. curing temperature at 1,000 and 9,000 psi.

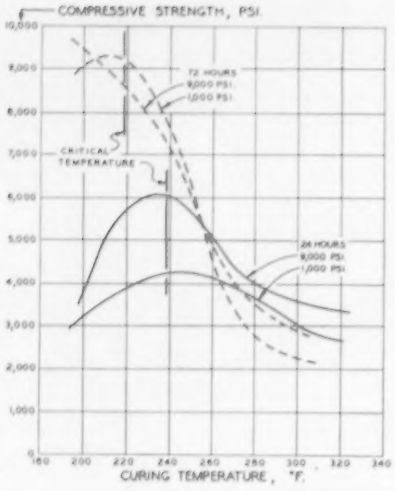

COMPRESSIVE STRENGTH, PSI
72 HOURS 9,000 PSI 1,000 PSI
CRITICAL TEMPERATURE
24 HOURS 9,000 PSI 1,000 PSI
CURING TEMPERATURE, °F

Fig. 4—Slow-set cement C. Compressive strength vs. curing temperature at 1,000 and 9,000 psi.

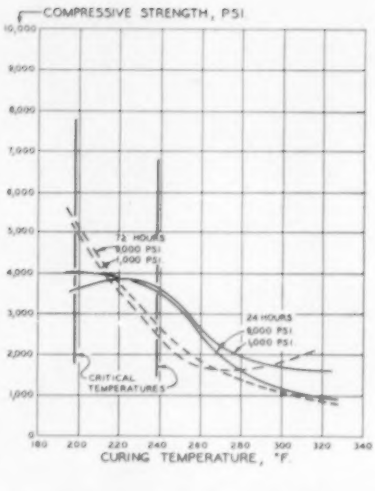

COMPRESSIVE STRENGTH, PSI
72 HOURS 9,000 PSI 1,000 PSI
24 HOURS 9,000 PSI 1,000 PSI
CRITICAL TEMPERATURES
CURING TEMPERATURE, °F

Fig. 5—A.S.T.M. Type 1 cement. Compressive strength vs. curing temperature at 1,000 and 9,000 psi.

cement strength noted in the 3-day strength tests (Figs. 2 through 5) indicated the advisability of conducting long-term tests on commonly used oil-well cements.

Laboratories agreed to conduct a series of tests to establish: (1) the operability of the testing procedure, and (2) the degree of severity of cement strength retrogression over a period of 28 days. Both compressive and tensile strength tests were to be employed to insure that no factor was overlooked in this survey. Schedule 9S (16,000 ft. WST) was selected as the testing schedule.

The results of these tests, together with an identification of type of cement used, are shown on Figs. 6 and 7.

A careful review of the data plotted on Figs. 6 and 7 reveals that all cements tested with the exception of slow-set cement C (tensile strength) experienced severe retrogression of strength during the first 7 days. This loss of strength during the first week amounted to a maximum of approximately 70 per cent for slow-set cement D (compressive strength) and a minimum of approximately 4 per cent for slow-set cement A.

All cements, with the exception of slow-set cement E, evidenced a regaining of strength after approximately 7 days. Cement E, however, was still losing strength after 28 days.

Figs. 2 through 5 illustrate that for a given curing time a certain temperature exists above which the cements appear to undergo serious strength loss. For example, compressive strength tests on slow-set cement A (Fig. 2) show that for temperatures between 200° and 240° F. little change in strength was noted. However, at temperatures above 240° F., severe decreases in strength were noted until at 320° F. only 33 per cent of the 240° strength was exhibited. This point of inflection has been arbitrarily termed the critical temperature and had been so labeled on the figures.

From these data it appears that there should be no loss in ultimate strength at curing temperatures less than 200° F., which means that many wells (those less than approximately 8,000 ft. deep) will not be involved in this problem, and that the surface pipe and intermediate pipe on many more wells will have curing temperatures so low as to have little effect on cement-strength development.

How much needed . . . The strength retrogression observed in this study raises the question, "How much strength is needed in oil well cementing operations?" It is generally recognized that hardened oil-well cement slurries must develop certain minimum strength to secure the pipe in the hole, exclude undesirable well fluids, and withstand the shock of drilling and perforating. The forces on an annulus of cement slurry in the well, in simplest terms, are assumed to be composed of a hori-

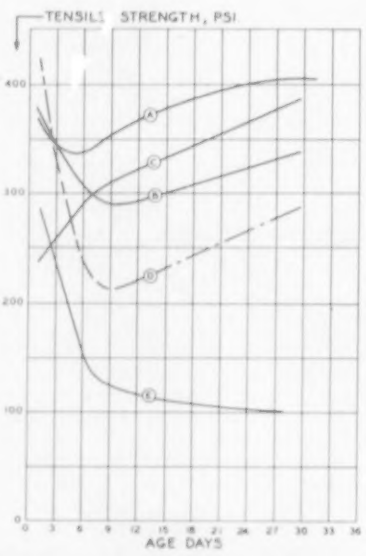


Fig. 6—Cement tensile-strength test; 16,000 ft. cement curing well-simulation test (Schedule 9S).

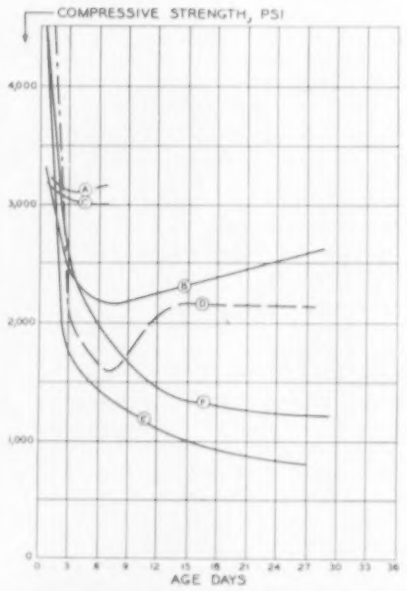


Fig. 7—Cement compressive strength; 16,000 ft. cement curing well-simulation test (Schedule 9).

zontal compression force (formation pressure) plus a vertical or nearly vertical shearing or tensile force (weight of pipe).

Farris[1] has reported the results of tests on bonding strength of cement to 5½-in. pipe versus tensile strength. His data show that, when the cement developed an estimated tensile strength of only 8 psi., each lineal foot of it in the annulus was strong enough to support 267 ft. of 5½-in. o.d., 17-lb. pipe.

Although the other requirements listed above plus the possibility of contamination of the cement slurry with mud or other fluids in the hole require tensile strengths greater than 8 psi. for a sound cementing job, this and other investigations have resulted in the general recognition by the oil-producing industry that high strengths, such as obtained with neat cement, are not necessary.

Different companies have set up their own minimum strength requirements and, although these vary from firm to firm, one such requirement is a 500-psi. compressive strength or a 100-psi. tensile strength in 24 hours based on laboratory tests. In this study, both compressive and tensile strengths have been employed although it is recognized that the question of which strength is a better criterion has not been determined.

A careful review of the data developed in evolving the test schedules demonstrated the critical nature of rate of heating on the ultimate strength of cement. This factor, coupled with known average bottom-hole cementing and static temperature plus limited bottom-hole information on the time required for the cement to attain static uation procedure.

Reference

1. Farris, R. F., "A Practical Evaluation of Cements for Oil Wells," A.P.I. Drilling and Production Practice (1941), pp. 283-292.

Recommended Additional Reading

1. Bell, H. W., and Grimin, M. W., "Some Tests on Cement and Cement Accelerators"; Bulletin of A.A.P.G., Vol. 12, p. 279, 1928.

2. Craft, B. C., Johnson, T. J., and Kirkpatrick, H. L., "Effects of Temperature, Pressure and Water-Cement Ratio on Setting Time and Strength of Cement," Transactions of A.I.M.E., Vol. 114, p. 62-68, 1935.

3. Standard Methods of Test for Compressive and Tensile Strengths of Hydraulic Cement Mortars, A.S.T.M. Designations: C 109-50 and C 190-49. A.S.T.M. Standards on Cement, 1952.

4. A.P.I. Recommended Practice for Testing Oil Well Cements, Third Edition, April 1953, RP 10B.

5. Farris, R. F., "Method for Determining Minimum Waiting-on-Cement Time." Petroleum Technology, January 1946, Tech. Pub. No. 1968.

6. A.P.I. Std. RP 10A, First Edition, March 1953.

How to Use Bentonite-Diesel Oil Cement Mixtures to Restore Lost Circulation

by P. P. Scott, Jr., J. L. Lummus, and G. C. Howard

BASED on the results of both laboratory and field tests, following is a procedure for employing a slurry of diesel oil, bentonite, and cement for overcoming lost circulation:

1. Locate lost-circulation zone by a suitable well-surveying technique such as a temperature survey.

2. Prepare a special drill-pipe sub by plugging one end of a short section of drill pipe and drilling 15 to 20 holes, ½ in. in diameter, spaced at random in the bottom 10 ft. of the joint.

3. Run the special sub on drill pipe into the hole to a point 5 to 20 ft. above the uppermost lost-circulation zone.

4. Pump 10 bbl. of diesel oil into the drill pipe.

5. Mix a slurry of bentonite, cement, and diesel oil using a jet mixer and pump directly into the well. Slurry weight should be approximately 11.5 lb. per gallon. A total volume of slurry of 180 cu. ft. has been found satisfactory. Caution: All pumping and mixing equipment through which the slurry will pass must be free of water.

6. Displace the slurry down the drill pipe and follow with 5 bbl. of diesel oil.

7. When the 10-bbl. cushion of diesel oil reaches the drill-pipe sub, close the blowout preventer and start pumping mud into the annulus while the slurry is being pumped down the drill pipe.

8. Displace one-half the slurry into the formation at a fast pumping rate.

9. Displace the next one-fourth of the volume of slurry at a rate of 2 bbl. per minute (mud rate: 1 bbl. per minute).

10. Displace the remaining one-fourth volume of slurry at 1 bbl. per minute (mud rate: ½ bbl. per minute).

11. The final bottom-hole pressure during displacement should be 300 to 500 psi. greater than the maximum hydrostatic head anticipated while drilling.

12. If insufficient squeeze pressure is obtained, raise the drill pipe one joint and repeat the treatment. If no displacement pressure is observed, the volume of slurry may be doubled on subsequent stages.

13. After sufficient squeeze pressure is obtained, pull the drill pipe slowly up into the casing while pumping mud into the annulus to replenish the volume occupied by the removed drill pipe.

14. The drill pipe may be pulled, the bit replaced, and the pipe run back into the hole 4 hours after the plug is placed.

15. After a minimum w.o.c. time of 8 hours, the plug may be drilled.

16. If, while drilling the plug, circulation is again lost, the treatment should be repeated with the sub set 5 to 20 ft. above the new location of the lost-circulation zone.

17. Should diesel oil-bentonite-cement plugs fail to seal the lost-circulation zone, preparation should be made for dropping prism-shaped blocks.

18. Set a cement plug with its top just below the lost-circulation zone.

19. Run open-end drill pipe to a point 10 ft. above the lost-circulation zone.

20. Drop prism-shaped blocks through the drill pipe and spud pipe after dropping every 10 to 20 blocks to force them back into the lost-circulation zone. Continue dropping the blocks until they begin to back up into the hole. Circulation should be attempted frequently to assure that the pipe is clear.

21. Repeat steps 3 through 15.

Field test . . . While drilling at 7,997 ft. in State "AB" well No. 1, Eddy County, New Mexico, complete loss of returns occurred which was not remedied with ordinary lost-circulation materials. Drilling was continued without returns to 8,197 ft.

A mixing sub was lowered to approximately 7,980 ft., the rams closed, and a slurry of cement, bentonite, and 100 bbl. of diesel oil displaced down drill pipe. Diesel-oil cushions of 10 bbl. were used ahead of and behind slurry. While displacing the slurry out the mixing sub, mud was pumped down annulus. Soon after the slurry reached the sub, the annulus filled. Annulus pressure increased to 1,000 psi. while displacing the slurry.

After 10 hours, plug was drilled to total depth with full returns. Mud weighing 9 lb. per gal. was conditioned and drilling continued with full returns.

Authors are with Stanolind Oil & Gas Co., Tulsa. From a paper presented at Denver meeting, A.A.O.D.C., October 4, 1953.

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Centrifugal Compressors:

How Gas Constants Enter Into Design and Performance—2

by Sherman L. Cole

IN the first installment of this series, Fig. 1 was presented, showing on a pressure vs. volume plot how the "K" value of a gas influences rate of change of gas density as the gas is compressed. The theoretical adiabatic path of compression is indicated on this plot, starting with intake conditions of P_1, V_1, and going to a given discharge pressure, P_2. The curve shows that for any pressure above intake pressure, specific volume in cubic feet per pound is greater with a high "K"-value gas than with a gas having a low "K" value.

Calculations follow to show how the density will, therefore, be lower for the higher-"K"-value gas with rise in pressure.

P_1 = intake pressure, = 14.7 psia.
V_1 = intake volume = 10,000 cu. ft. per minute
P_x = assumed pressure = 30 psia. higher than P_1
T_1 = intake temperature = 100° F. = 560° R.
MW = molecular weight = 28.95
Z = supercompressibility = 1.0

Let "K" in the first case equal 1.4 and in the second case equal 1.35.

Case 1

Since $P_1V_1 = W_1RT_1Z_1$

(a) Gas density at intake:

$$= W_1/V_1 = \frac{144 \times 14.7}{(1{,}544/28.95)\ 560 \times 1.0}$$

= 0.071 lb. per cu. ft.

(b) Total pounds of gas flowing = 0.071 × 10,000 = 710 lb. per minute.

Since $P_1V_1^K$ = constant = $P_xV_x^K$.

$$\text{(c) } V_x = \frac{V_1}{(P_x/P_1)^{1/k}} = \frac{10{,}000}{(2.04)^{0.715}}$$

= 6,000 cu. ft. per minute.

$$\text{(d) Gas density at } P_x = \frac{710}{6{,}000}$$

= 0.1182 lb. per cu. ft.

Case 2

Since $P_1V_1 = W_1RT_1Z_1$

(a) Gas density at intake:

$$= W_1/V_1 = \frac{144 \times 14.7}{(1{,}544/28.95)\ 560 \times 1.0}$$

= 0.071 lb. per cu. ft.

(b) Total pounds of gas flowing = 0.071 × 10,000 = 7.0 lb. per minute.

Since $P_1V_1^K$ = constant = $P_xV_x^K$.

$$\text{(c) } V_x = \frac{V_1}{(P_x/P_1)^{1/k}} = \frac{10{,}000}{(2.04)^{0.741}}$$

= 5,900 cu. ft. per minute.

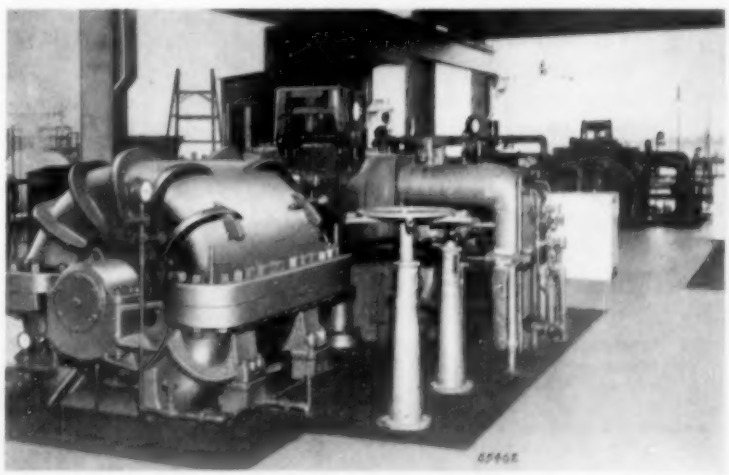
$$\text{(d) Gas density at } P_x = \frac{710}{5{,}900}$$

= 0.1203 lb. per cu. ft.

Comparing the value of 0.1182 lb. per cu. ft. obtained in Step 1(d) with the 0.1203 lb. per cu. ft. obtained in Step 2(d) illustrates the effect of "K" value on density for adiabatic compression with all other factors remaining constant.

Although it is true that the actual path of compression in a compressor is not adiabatic, it is permissible to illustrate our point on the theoretical basis with the statement that the actual path of compression (polytropic, along some exponential path "N") would show the same relative relationship. Deviation from the theoretical adiabatic path of compression "K" depends upon the actual compressor internal efficiency.

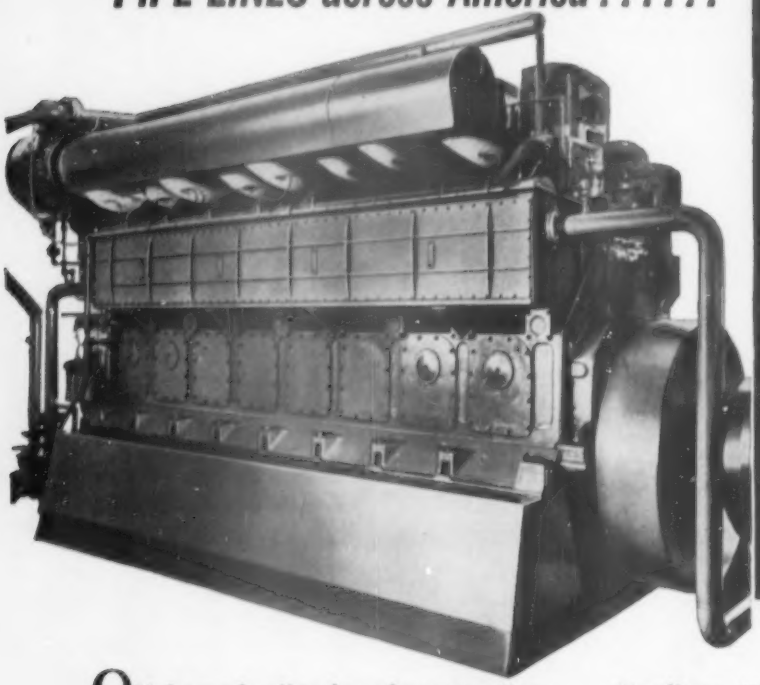
In Cases 1 and 2 above, the actual density of the gas, in a compressor designed for these conditions, would be in the order of 0.11 lb. per cu. ft. for 1(d) and 0.113 lb. per cu. ft. for 2(d). This is assuming equal actual internal-compressor efficiency in both cases.



Ingersoll-Rand multistage centrifugal compressors at a catalytic cracking plant. Compressors such as these would be built for the hypothetical design conditions listed in the chart to follow in the next installment.

Author is engineer with Ingersoll-Rand Co., Phillipsburg, N. J., turbo-blower department.

On the CRUDE OIL and PRODUCTS PIPE LINES across America . . . . . .



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O-1053

Separation of Natural-Gas Liquids—3

by John M. Campbell

THE systems available for separation may be generally subdivided as follows:

1. Flowing and/or pumping wells.
   (a) Normal separation.
   (a) Mechanical refrigeration and/or water cooling.
2. High-pressure wells (ΔP greater than 500 psi.).
   (a) Heater, choke, and separator.
   (b) Expansion refrigeration using a hydrate inhibitor.
   (c) Expansion refrigeration without a hydrate inhibitor, melting the hydrates formed.
3. Each of the above equipped with:
   (a) Stage separation, or
   (b) Stabilization.

The general characteristics of each system are summarized in Table 1. Figs. 2-4 illustrate typical flow diagrams for various low-temperature systems. The flow sheet for mechanical refrigeration is identical to Fig. 4 except that the choke is replaced by a chiller. Such systems have been widely discussed and summarized. The systems of different manufacturers differ in mechanical details, but the principle is substantially that shown.

The simple low-temperature unit shown in Fig. 2 is quite common in Oklahoma where there are many small high-pressure wells producing in the absence of free water at relatively low flowing temperatures. The purpose of the heater is to keep the temperature of the high-pressure gas above the hydrate point after being cooled in melting the hydrates.

An alternative is to flow the well directly to the choke using a low-pressure steam generator for the coils. When using a heater, a bypass around the heating coil is recommended in order to obtain more flexibility. With a given coil area and hydrate temperature limitations, no control over the liquid temperature is otherwise directly provided.

The system shown in Fig. 3 is nothing more than this system with the addition of a free-water knockout and heat exchanger. The former is usually recommended, with the latter depending on flowing conditions.

Series on "Dehydration of Natural Gas and Light Hydrocarbon Liquids," by J. M. Campbell and L. L. Laurence, Petroleum Refiner, Vol. 31, August, October, and November, 1952; and Vol. 32, January, February, and March, 1953. *(See next page for Table 1 and Fig. 4).*

Author is manager of process equipment department, oil and gas division, Black, Sivalls & Bryson, Inc., Oklahoma City. Paper presented at ninth annual short course on gas technology, Texas A. & I. College, June 1954.

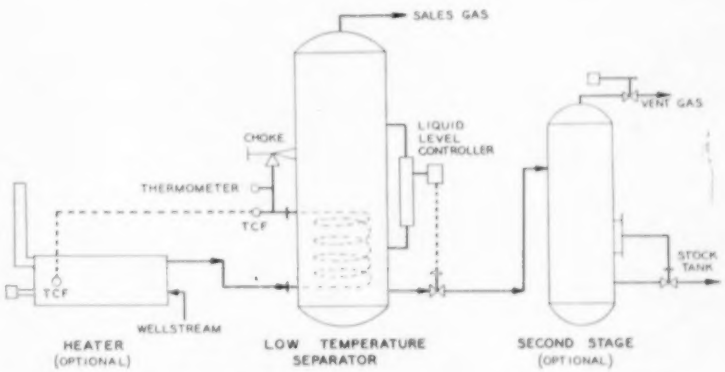

Fig. 2—Flow diagram for simple low-temperature separator, without hydrate inhibitor.

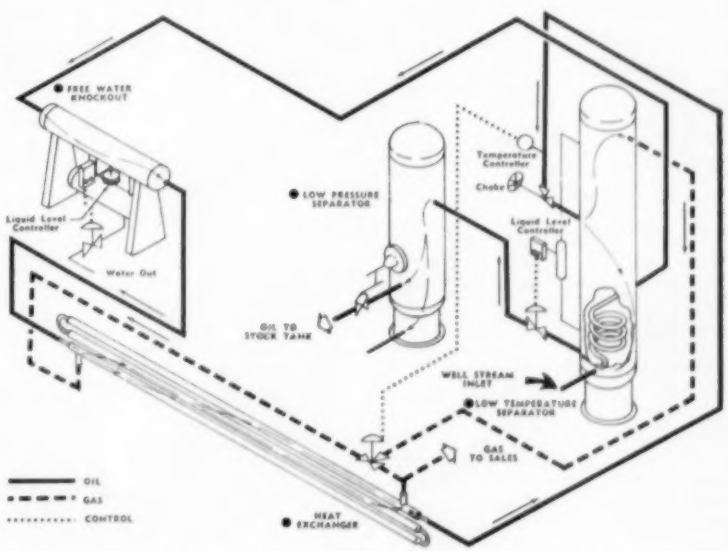

Fig. 3—Diagram for expansion refrigeration system without hydrate inhibitor.

TABLE 1—COMPARISON OF SEPARATION SYSTEMS

System—	Advantages	Limitations
Simple low temperature separator with heater	Inexpensive to buy and operate. Simple. Provides some degree of dehydration. Ideal for small wells with at least 1,200 psi. available where no free water is present. Offers potentially higher recovery.	Is not as flexible as other units. Not applicable in presence of appreciable quantities of free water.
Expansion refrigeration without hydrate inhibitor	Less expensive to buy and operate than glycol injection. Simpler than glycol injection. Normally higher recovery than stage separation. Possesses flexibility with pressure drops greater than 1,000 psi. Provides at least partial dehydration.	Less flexibility than glycol injection. Heat balance must be maintained to melt hydrates formed. Control of temperatures is relatively critical. Does not operate efficiently at pressure differentials less than 1,000 psi.
Stage separation	Slightly cheaper in first cost. Simple and easy to operate. Better for handling heavy and low pour point oils.	If heater is necessary, operating cost is high. Normally gives less recovery. No dehydration provided.
Glycol injection with expansion or mechanical refrigeration	More effective dehydration. Greater flexibility. Hydrates never allowed to form. Will operate efficiently on pressure differentials less than 1,000 psi. Operates successfully at lower temperatures. Will normally show higher liquid recovery.	Highest first cost. Operating cost higher than simpler expansion systems. More complex.

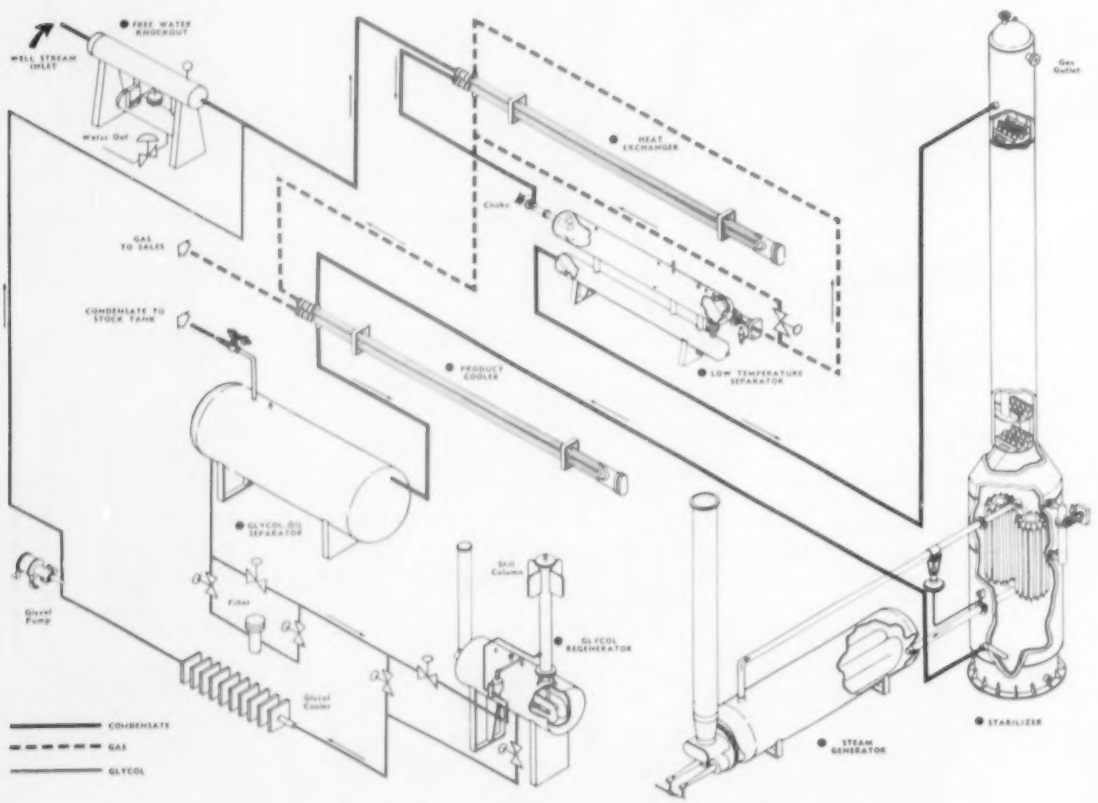

Fig. 4—Flow diagram for expansion refrigeration system with hydrate inhibitor.

by W. L. Nelson
Technical Editor

PROGRESS IN METALS

Application of Iron Castings and Low-Alloy Steels in Refining

SO very many compositions of alloy irons and low-alloy steels have been proposed and applied that Table 1 here is only an indication of a few of the materials that have been employed. Although plain carbon steel and plain gray iron are seldom shown, in the table, it is obvious that most refinery equipment is constructed of these common varieties rather than alloyed irons and steels.

A remarkable material has been developed since 1948, namely, ductile cast iron and its full usefulness is not yet apparent especially in the form of alloyed ductile irons. It has, however, the following highly useful properties of strength, hardness, and ductility, and is relatively cheap:

	Grade	T.S.	Y.P.	Elong.	Brinell	Condition
Ductile C.I.	60-45-15	60,000	45,000	15	195	Annealed
Steel	B-2	60,000	30,000	15	130	Annealed
Malleable iron	32510	50,000	32,000	10	130	Annealed
Bronze	87-7-5-1	36,000	17,000	22	45	As cast
Bronze	88-10-2	36,000	13,000	18	18	As cast
Cast iron	30	30,000	30,000		243	As cast

Some of the Irons and Low-Alloy Steels Used in Oil Refining

Service—	Material	Composition, per cent C	Ni	Cr	Mo	Mn	Cu	Si	Properties T.S.	Y.P.	Elong.	Brinell
Bars (see chains)												
Bolting—valves, etc.	S.A.E. 4140 Q&T	0.4		0.9	0.21	0.9		0.27	*73,000	140,000	16	315
	S.A.E. 3140	0.4	1.25	0.6		0.8		0.27	*70,000	134,000	15	300-352
	S.A.E. 3240	0.4	1.75	1.1		0.45				125,000	16	302
	S.A.E. 2330	0.3	3.5			0.7		0.27		134,000	18	300-325
	S.A.E. 4615	0.15	1.8		0.25	0.5		0.27		95,000	24	269
	Tungsten steel			0.45			(1.0 W)		*120,000			
Bolts—connecting rod	S.A.E. 4340	0.4	1.8	0.8	0.25	0.7		0.27		120,000		
Bearings and pins (heavy duty)	S.A.E. 2315	0.15	3.5			0.45		0.27	(Carburized)			600+
	S.A.E. 3115	0.15	1.25	0.6		0.45		0.27	(Carburized)			600+
	S.A.E. 4615	0.15	1.75		0.25	0.45		0.27	(Carburized)			600+
Brake drums	Alloy iron	3.25		0.5			1.5	1.95	40,000			
	Alloy iron	3.17		(0.3 Va)			1.75	2.0	52,000			
Brake drums (heavy duty)	Alloy iron	3.25			0.5		1.5	2.1	45,000			
Brake drums (heavy duty)	Alloy iron	3.2	1.25		0.75	(0.15 Va)		1.85	57,000			245
Brake bands	Cast steel	0.35	3.0			0.9				60,000	18	
	S.A.E. 3140	0.4	1.25	0.6		0.75				60,000	20	
Bubble caps—sour crude	Ni-Resist iron	3.0	15.0	2.0		1.1	6.0	2.0	26,000			165
Bushings—catalyst elevator chain	Ni-Hard iron	0.1	4.5	1.5	0.5			0.5				
Cams	S.A.E. 4340	0.4	1.8	0.8	0.25	0.7		0.27				
Casings (see pumps)												
Catalyst elevator bushings	Ni-Hard iron	0.1	4.5	1.5	0.5			0.5				
Centrifugal pump casing (salt water)	Alloy iron	3.2	1.6			0.65		1.4				
Chain—links or bars	S.A.E. 2345 Q&T	0.45	3.5			0.65		0.27	100,000		25	225
	S.A.E. 3045 Q&T	0.45	0.65	0.65		0.85			100,000		24	230
	S.A.E. 3140 Q&T	0.4	1.25	0.6		0.65		0.27	110,000		24	220
	S.A.E. 4135 Q&T	0.35		0.65	0.25	0.65		0.27	115,000		26	225
	S.A.E. 4640 Q&T	0.4	1.75		0.25	0.5		0.27	115,000		22	235
	S.A.E. 5140 Q&T	0.4		0.95		0.75		0.27	100,000		23	210
	S.A.E. 6135 Q&T	0.35		0.95		0.45	(0.18 Va)		105,000		23	230
	S.A.E. 1040 Q&T	0.4				0.65			95,000		23	200
Chain—pins	Alloy steel	0.15	2.7	1.0						124,000		
	S.A.E. 2512	0.12	5.0			0.45		0.27	(Carburized)			600+
	S.A.E. 3245 Q&T	0.45	1.75	1.0		0.45		0.27		140,000	18	330
Clutch plates—engine	Alloy iron	3.3	1.5	0.4		0.65		2.1	35,000			220
	Alloy iron	3.1		0.35		(0.1 Va)		2.0	57,000			245
	Mang. steel	1.1				12.5		0.6	120,000			200
Compressor cylinders	Ni-Cr iron								57,000			
Condenser coils	Alloy iron	3.4				0.55	0.9	1.7	32,000			215
Condenser coil headers (sour crude)	Ni-Resist iron	2.9	15.0	2.0		1.1	6.0	2.0	26,000			165
Connecting-rod bolts	S.A.E. 4340	0.4	1.8	0.8	0.25	0.7		0.27				
Crankshaft—pump (heavy duty)	Cast 4340	0.4	1.8	0.8	0.25	0.7		0.27		110,000		250
Crankshaft—diesel	Alloy iron	2.6	1.15		1.1	0.95		2.5	78,000			302
Crosshead bolts	S.A.E. 3140 Q&T	0.4	1.25	0.6		0.65		0.27				
Crossheads—diesel	Cast steel Q&T	0.3	1.5			0.9	(0.1 Va)			105,000		250

(Continued on next page)

Some of the Irons and Low-Alloy Steels Used in Oil Refining

Service—	Material	Composition, per cent							Properties			
		C	Ni	Cr	Mo	Mn	Cu	Si	T.S.	Y.P.	Elong.	Brinell
Crosshead guides	Cast 4620	0.2	1.8	...	0.25	0.55	...	0.27	...	70,000	...	...
Cylinder blocks	Alloy iron	3.3	...	...	...	...	0.75	1.95	33,000	...	...	...
Cylinder heads	Alloy iron	3.3	1.25	0.45	...	0.55	...	2.1	38,000	...	...	220
Cylinder heads—diesel	Alloy iron	3.0	...	...	0.5	...	(0.1 Va)	2.1	57,000	...	...	245
Cylinder heads—diesel	Alloy iron	3.2	...	0.6	1.0	0.8	...	2.0	...	...	...	341
Cylinder heads—diesel	Alloy iron	3.6	...	0.4	0.9	0.85	...	1.6	...	...	...	277
Cylinder heads—diesel	Alloy iron	3.1	1.25	...	0.7	0.85	(0.1 Va)	1.8	61,000	...	...	302
Cylinder liners	Alloy iron	3.1	1.0	...	...	0.8	...	1.0	40,000	...	...	220
Cylinder liners	Alloy iron	3.2	1.75	0.5	...	0.55	...	2.0	36,000	...	...	220
Cylinder liners—diesel	Alloy iron	2.9	...	...	0.8	1.05	1.8	2.2	65,000	...	...	...
Cylinder liners—diesel	Alloy iron	2.9	0.45	0.4	0.85	0.85	...	2.1	51,000	...	...	269
Cylinder liners—diesel	Alloy iron	3.1	...	0.6	1.05	0.85	...	2.1	52,700	...	...	277
Cylinder liners—gas engines	Alloy iron	2.8	1.5	0.4	...	0.6	...	...	45,000	...	...	...
Cylinder liners—heat treated	Alloy iron	3.1	3.5	...	0.3	0.6	...	2.1	50,000	...	...	240
Cylinder liners—heat treated	Alloy iron	3.0	0.65	...	0.4	0.7	...	...	50,000	...	...	250
Diesel engines (see specific parts)												
Exhaust manifolds	Alloy iron	3.5	2.0	0.75	...	0.65	...	1.8	36,000	...	...	200
Expansion joints (extreme duty)	Alloy steel	...	...	...	0.25	1.2	...	...	...	60,000	25	200
Fittings—cast iron (corrosive service)	Alloy iron	3.4	0.2	0.3	...	0.55	...	1.5	35,000	...	...	225
Fly wheels	Alloy iron	3.4	...	...	...	1.1	0.75	1.6	36,000	...	...	...
Gears (extreme duty)	S.A.E. 4820 carb.	0.2	3.5	...	0.25	0.6	...	0.27	...	103,000	21	600+
Gears—diesel	Alloy iron	3.2	1.75	0.4	0.6	0.7	...	1.6	57,000	...	...	269
Gears—reducing (heavy duty)	S.A.E. 4620	0.2	1.8	...	0.25	0.5	...	0.27	...	...	...	...
Guide bolts (compressors)	S.A.E. 3140 Q&T	0.4	1.25	0.6	...	0.8	...	0.27	...	...	...	...
Pistons—diesel	Alloy iron	3.2	...	0.55	0.9	0.7	...	2.0	53,000	...	...	293
	Alloy iron	2.6	1.25	...	0.7	0.7	(0.12 Va)	1.6	67,000	...	...	248
	Alloy iron	2.9	1.5	...	0.6	...	(0.1 Va.)	1.7	57,000	...	...	245
	Alloy iron	3.4	1.0	...	...	0.65	...	2.5	32,000	...	...	180
Piston rings	Alloy iron	3.15	1.25	...	...	0.7	...	1.3	37,000	...	...	210
Piston rod nuts	S.A.E. 3140	0.4	1.25	0.6	...	0.8	...	0.27	...	120,000	...	...
Pipe, high strength	Alloy steel	0.45	...	...	0.2	1.5	...	0.22	...	95,000	20	210
	Alloy steel	0.5	...	...	...	1.6	(0.1 Va)	...	...	95,000	20	210
	Alloy steel	0.2	...	0.5	...	1.2	...	0.75	...	54,000	18	150
	Alloy steel	0.25	...	...	0.2	1.4	...	...	...	70,000	17	...
Pump bodies	Alloy iron	3.3	...	0.35	...	...	1.0	2.3	35,000	...	...	...
Pump bodies heavy duty)	Cast S.A.E. 4340	0.4	1.8	0.8	0.25	0.7	...	0.27	...	75,000	...	200
Pump rods	S.A.E. 4615	0.15	1.8	...	0.25	0.5	...	0.27	(Carburized)	...	...	600+
Pump rods	S.A.E. 4820	0.2	3.5	...	0.25	0.6	...	0.27	(Carburized)	...	...	60 Rockwell
Pump rods	S.A.E. 3145 Q&T	0.45	1.25	0.8	...	0.8	...	0.27	...	125,000	17	300
Pump rods	S.A.E. 2325 Q&T	0.25	3.5	...	...	0.7	...	0.27	...	100,000	18	200
Pump rods	S.A.E. 4140 Q&T	0.4	...	0.9	0.21	0.9	...	0.27	...	130,000	18	300
Pinions	S.A.E. 4620 Q&T	0.2	1.8	...	0.25	0.5	...	0.27	...	140,000	18	320
	S.A.E. 3140 Q&T	0.4	1.25	0.6	...	0.8	...	0.27	...	125,000	16	300
	Alloy steel	...	1.75	0.65	0.3	...	...	...	...	160,000	16	350
Reaction chambers	S.A.E. 6120	0.2	...	0.9	...	0.45	(0.17 Va)	...	...	...	...	...
Roller bearings	S.A.E. 2320	2.0	3.5	...	...	0.5	...	0.27	(Carburized)	...	...	600+
Shafts	S.A.E. 4620 Q&T	0.2	1.8	...	0.25	0.5	...	0.27	...	140,000	18	320
	S.A.E. 3140 Q&T	0.4	1.25	0.6	...	0.8	...	0.27	...	125,000	16	300
	Alloy steel Q&T	...	1.75	0.65	0.3	...	...	...	...	160,000	16	350
Steam valve tappets or stems	S.A.E. 3140 Q&T	0.4	1.25	0.6	...	0.8	...	0.27	...	...	...	...
Tanks	Carbon steel	0.12	...	...	...	0.5	...	...	...	31,000	28	...
	Va. steel	0.19	...	...	...	...	(0.15 Va)	...	...	42,500	40	...
	Alloy steel	...	...	0.5	...	1.2	...	0.75	90,000	...	...	...
Tube supports	Cast iron	3.0	...	...	...	...	...	1.75	...	...	...	...
Tube supports to 900° F.	Alloy iron	3.0	...	0.75	...	...	...	1.2	...	...	...	...
Tube supports to 1,000° F.	Alloy iron	3.2	2.5	0.65	...	...	...	1.6	...	...	...	...
Valve—bolting (see bolting)												
Valve—seats	S.A.E. 4150 Q&T	0.5	...	0.9	0.2	0.9	...	0.27	...	125,000	17	275
Valve—seats	S.A.E. 3140 Q&T	0.4	1.25	0.6	...	0.8	...	0.27	...	100,000	20	250
Valve—body	Alloy cast steel	0.3	1.5	0.6	0.25	...	...	...	*73,000	75,000	18	205
Valve—stem	S.A.E. 4140	0.4	...	0.9	0.21	0.9	...	...	*70,000	140,000	16	315
Valve—stem	S.A.E. 3140	0.4	1.25	0.6	...	0.8	...	0.27	...	134,000	15	325
Valve—stem	S.A.E. 3240	0.4	1.75	1.1	...	0.45	...	...	...	125,000	16	302
Valve—stem	S.A.E. 2330	0.3	3.5	...	...	0.7	...	0.27	...	134,000	18	310
Valve—stem	S.A.E. 4615	0.15	1.8	...	0.25	0.5	...	0.27	...	95,000	24	270
Valve—stem	Tungsten steel	...	...	0.45	...	...	(1.0 W)	...	*120,000	...	...	...
Vessels	Alloy steel	...	...	...	0.5	...	...	...	...	...	...	...
	Alloy steel	...	...	0.5	0.5	...	...	...	...	...	...	...
	Alloy steel	...	...	0.5	1.0	...	...	...	...	...	...	...

*Tensile strength at 900° F.

Getting the Most Out of Mud Equipment—3

by E. E. Huebotter,* T. H. Dunn†, and Frank Bell‡

THE proper layout of equipment used in the preparation and maintenance of drilling fluids is very important in order to reduce waste of materials and time and to permit treatments and changes sometimes impossible with other ordinary arrangements. In Fig. 1 is shown a drilling-rig layout for handling drilling fluids which provides facilities for operations and treatments not existing in many arrangements and which would allow preparation and maintenance of better drilling fluids at lower cost.

Each circulating pit is provided with adequate flow-control partitions; bypasses for the shale and sand and the fine sand and silt pits; jets; and guns for maximum settling, degassing, cleaning, mixing, and agitating. The refuse-reclamation-reserve pit receives and separates the drilling fluid and water from the jetted drilling debris.

The clean drilling fluid and water are collected in a sump near the suction pit for future or emergency use. A jet is provided in the sump to return the clean drilling fluid and water to the suction pit of the drilling-fluid system if they will not flow by gravity.

Storage is provided for excess mud for future or emergency use. Storage is also provided for water, and water lines are laid to tie directly into the suction pit and into the pump suctions for use in jetting, thus conserving drilling fluid. An oil tank is provided with a hookup to add oil to the drilling fluid through the pump suction when an oil-emulsion mud is desired. Storage tanks and mud house are easily accessible by trucks for loading and unloading.

Jetting down . . . The volume of drilling fluid retained in the circulating system should be held down to assure low treating costs. This volume should be reduced to a minimum at the start of each treatment and especially so when the drilling fluid is to be densified, converted to a high-percentage oil emulsion, or converted to a lime or gyp-base mud where considerable dilution is necessary.

Density . . . The density of drilling fluids should be carried as high as practicable resulting from native solids for most economical maintenance costs. Fifty per cent more water is required to compound and maintain a water-base drilling fluid with native solids at 9.8 lb. per gal. than at 10.5 lb. per gal., and twice as much water is required to compound and maintain the density at 9.5 lb. per gal. instead of 10.5 lb. per gal. Usually the unit costs of these drilling fluids will be comparable, hence mud costs can be reduced materially by carrying the higher densities with native solids; sometimes they can be cut in half.

Lost-circulation problems frequently can be handled as economically with the higher-density drilling fluids as with the lower-density drilling fluids by using the normally produced excess drilling fluid to take care of losses to the hole with the possible use of some formation sealing agents.

The advantages of lower costs and smaller water consumption realized with the use of denser drilling fluids containing higher native-solids contents frequently outweigh that of increased drilling rate resulting from the use of drilling fluids of less density.

Density vs. maximum density . . . In measuring the density, care should be taken to eliminate all entrained air and gas to obtain the maximum density that truly fixes the static hydrostatic pressure it produces. Entrained air or gas in drilling fluids has very little effect on the static hydrostatic pressure it produces.

Measuring both density and maximum density can possibly eliminate a recommendation to add a densifier and thus reduce maintenance costs. About 15 lb. per bbl. of barytes would be recommended to restore the density of a 10-lb. per gal. mud-air cut to 9.8 lb. per gal., in which case the air cutting would have a negligible effect on the static hydrostatic pressure of the mud. This recommendation would amount to an unnecessary cost of around $300 for a 1,000-bbl. system.

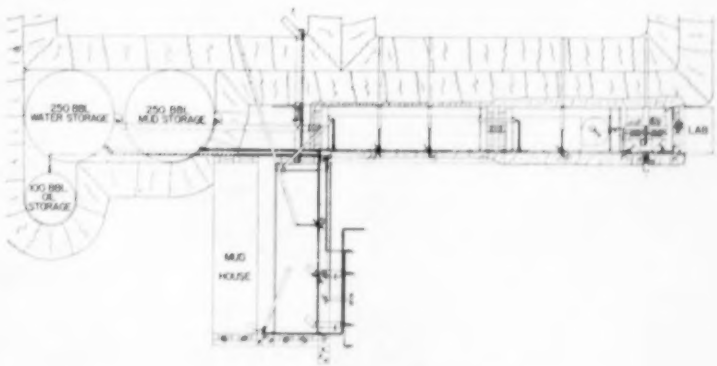

Fig. 1—Drilling-fluids equipment layout.

*Baroid, Tulsa. †Stanolind Oil & Gas, Tulsa. ‡Shell Oil Co., Wichita Falls, Tex. From a paper presented at Mid-Continent district meeting, A.P.I., Oklahoma City, March 17, 1954.

HIGH STRENGTH IS POUNDED INTO WATSON-STILLMAN FORGED STEEL FITTINGS

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REFINING

Asphalt May Boom

President's big highway proposal portends jump

WASHINGTON.—If President Eisenhower's recent proposal to spend $50 billion on highways during the next 10 years is followed, the total demand for asphalt during this period would more than double. And even if the program is not followed entirely, spokesmen in the asphalt industry believe that its proposal has focused further attention on the nation's highway needs and they foresee a steady growth in paving asphalt demand.

In the past 10 years, the nation has spent $34 billion on roads, $18 billion of it for new roads and $16 billion for maintenance. Should Eisenhower's plan be put into effect, the $50 billion capital expenditure would require an additional $25 billion for maintenance bringing the 10-year total to $75 billion.

Last year highway builders used 11 million tons for highways and about 6 million tons for roofing, industrial and miscellaneous uses. Total consumption for highway construction and maintenance has been increasing about 10 per cent a year, which would nearly double present consumption by 1963.

Conservative estimates of asphalt wants for the next 10 years point to a doubling of present needs even if the program is accepted only in part. Since the rate of asphalt demand is expected to continue outstripping the rate of total petroleum product demand, this will permit the yield of asphalt to rise from the current average of 2.1 per cent of crude run to stills, and may afford some diversion of residual fractions from low-priced fuel oil to asphalt markets in certain areas.

An attendent effect with any increase in asphalt demand would be a larger market for many heavy crudes with a high asphalt content.

New Catalyst Developed

NEW YORK.—American Cyanamid Co. has developed a new high alumina catalyst containing 25 weight per cent of alumina as compared with the normal 13 per cent content in synthetic catalysts. Following more than a year of performance tests in a commercial fluid unit at a major refinery, the company reports the new catalyst more efficient.

It has greater stability of catalytic activity, a 15 to 25 per cent higher equilibrium activity and in many cases, improved selectivity of end-product distribution. Howard E. Nehms, manager of the company's refinery chemicals department, said that the stack losses were considerably lower with the new catalyst. Expansion of present capacity will make additional quantities of the new catalyst available in the near future.

ASPPA Sees Substantial Boost in Jet-Fuel Needs

WASHINGTON.—The Armed Services Petroleum Purchasing Agency has told the National Petroleum Council

NELSON REFINERY CONSTRUCTION INDEX

Appears on the Refining page in the first issue each month.
Compiled by W. L. Nelson—Petroleum Refinery Consultant—Tulsa.
The Index was explained July 7, 1952 (p. 105) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July and October.

INDEX (1946 = 100)

	1948	1950	1951	1952	1953	April 1954
Pumps, Compressors, etc.	127.0	138.2	155.9	155.6	162.5	166.3
Electrical Machinery	127.6	134.9	154.3	152.4	156.4	160.3
Internal Combustion Engines	116.9	126.0	146.1	146.5	148.1	150.6
Instruments	120.0	127.8	142.3	146.2	151.8	153.9
Heat Exchangers	130.0	140.0	152.0	165.8	174.9	175.9
Miscellaneous Equipment Average	*122.1	*126.2	*145.1	153.3	158.8	161.4
Materials Component	139.3	149.5	164.0	164.3	172.4	173.6
Labor Component	128.0	144.0	152.5	163.1	174.2	180.3
Refinery Construction Index	132.5	146.2	157.2	163.6	173.5	177.6

*Used in computing the Nelson Index until April 1952. These are slightly different than the average of the Miscellaneous Equipment Items shown above.

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that military requirements for jet fuel during the 1955 fiscal year will be "substantially" greater than in 1954 while other petroleum fuels will be about the same.

During the fiscal year which began July 1, ASPPA spokesmen said the agency expects to buy 69,020,000 bbl. of JP-4 fuel, 28,114,000 bbl. of 115-145 aviation gasoline, 14,103,000 bbl. of 100-130 aviation gasoline, 12,929,000 bbl. of motor gasoline, 19,226,000 bbl. of diesel fuel, and 44,282,000 bbl. of navy special fuel oil.

A good part of the 1955 requirements have already been negotiated as more than half of the annual supply is contracted for in the first half of the fiscal year.

Actual procurement of JP-4 may differ from the requirement, the ASPPA explained, because of limited government-owned storage.

Refining Dividends Increase

WASHINGTON. — Refining corporations which make public announcement of their dividends paid shareholders $6,000,000 more in the first 5 months of this year than in the corresponding 1953 period, according to Commerce Department figures.

Dividend payments during the period were figured by the department at $257,300,000 against $251,300,000 last year. May dividends were somewhat less than those paid in April, $3,900,000 against $4,800,000, but were larger than a year ago by $300,000 in May and $200,000 in April.

Refining Briefs

CHICAGO.—Pure Oil Co. has developed two new motor oils. Called High HP Purelube and New Super Duty Purelube, the new oils protect and preserve the new high power engine.

WESTVILLE, N. J.—The Texas Co. has awarded a contract to Catalytic Construction Co. to build a 1,926-bbl. per day sulfuric alkylation unit at Texaco's refinery here.

HOUSTON.—Continental Oil Co. has introduced a new motor oil, New Super Motor Oil, to meet the exacting lubricating requirements of the new high-compression engines.

LOUISVILLE.—The Girdler Co. is making major additions to its catalyst capacity at its plant here. By late this year or early next year, new facilities will be in operation for manufacture of catalytic reforming, hydrogenation, desulfurization, carbon monoxide conversion, and oxygen removal catalysts.

See Composite and Refinery Catalogs, or Write for Folder On

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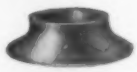

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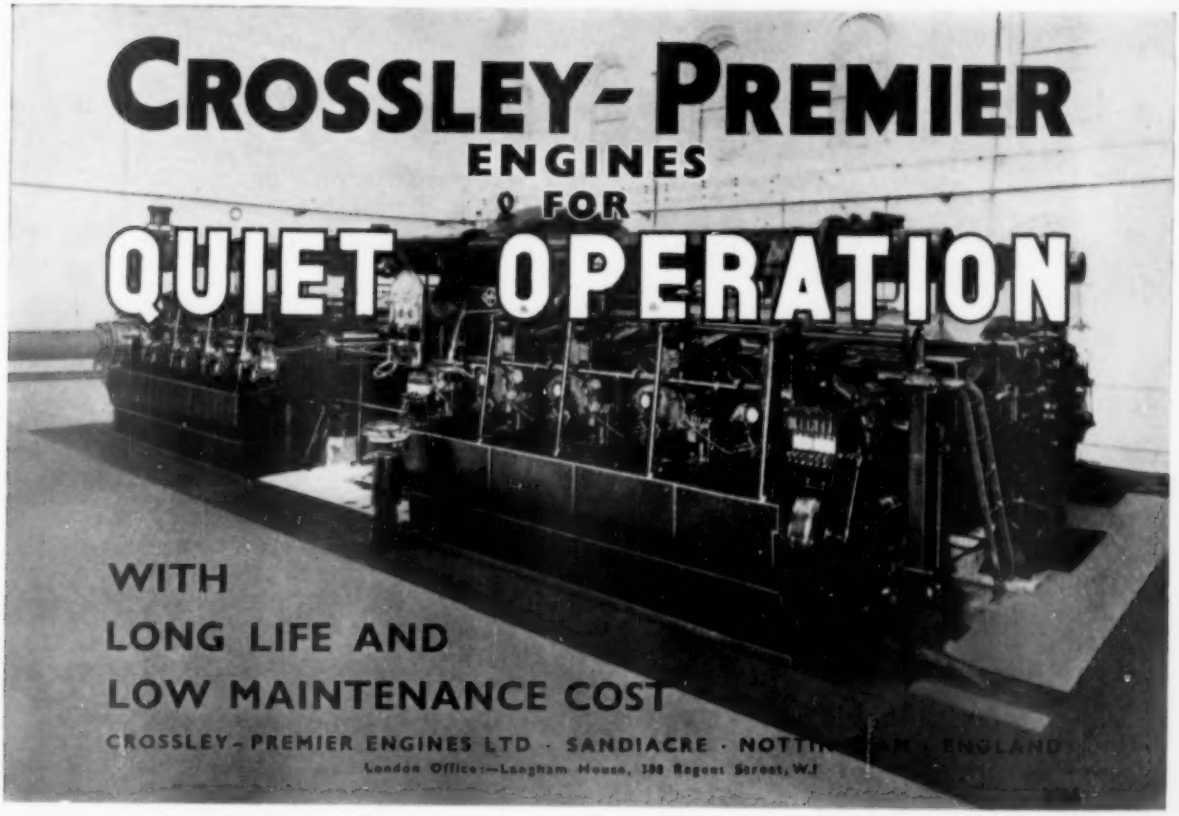

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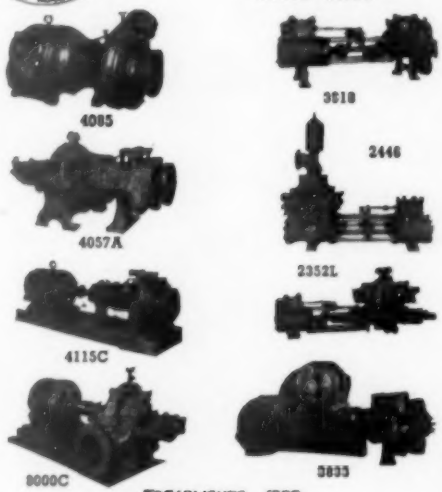

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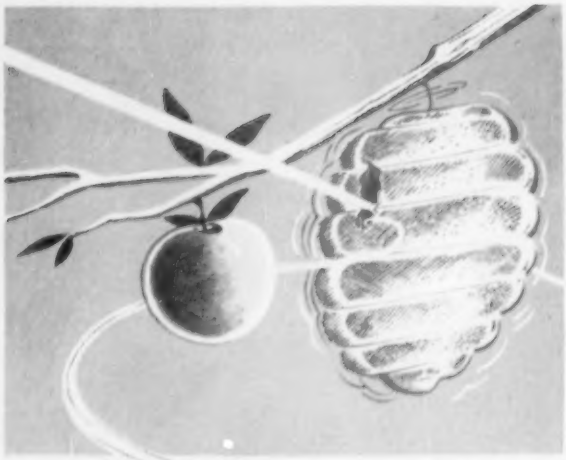
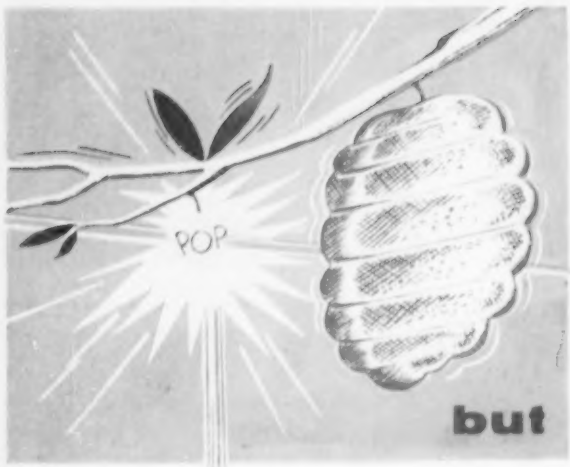


penetration's swell

(sometimes)



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Among the Drilling Contractors

Moutray-Moore Company Reorganized at Abilene

Lamar H. Moore, president of Moutray-Moore Drilling Co., Abilene, Tex., has acquired the stock controlled by the heirs of the late Waldo Moutray, his former partner, and has reorganized the company under the name of Lamar H. Moore Drilling Co.

Associated with him in the new organization are his four sons: Lamar H. Moore, Jr., vice president and treasurer; Robert R., vice president and secretary; Rex B. and Jay T., directors.

Moutray - Moore Drilling Co. has been operating three rotary rigs in the West Central Texas area. The company was organized in 1943 by the senior Moore and Moutray. It started with two cable-tool rigs, acquiring its first rotary rig in 1946. Since Moutray's death in 1947, Moore has operated the business alone.

Moore also is associated with his sons in another drilling company, Moore & Moore Drilling Co., which also operates three rotary rigs in the area.

R. L. Manning Co., Denver, has another new wildcat operation under way for Shell Oil Co. in Benson County, North Dakota. It is at 1 Christian Hvinden, in 21-151n-69w, 5½ miles south of Maddox. This is about 17 miles southwest of Shell's 1 Murphy-Christensen wildcat, south of Minnewaukan, which is another Manning contract job.

B. F. Allison Drilling Co., Casper, Wyo., has a rig working for Fred M. Manning on a wildcat test, 1 Viggo-Smith, in 29-1s-55w, 5 miles southeast of Woodrow, in Washington County, northeastern Colorado. Location is about 2½ miles west of the East Woodrow area.

Helmerich & Payne, Inc., Tulsa, has a contract with Gulf Oil Corp. for a deep, rank-wildcat test to be drilled in northwestern Utah. Location is in Boxelder County, 40 miles west of Salt Lake, in 14-6n-16w. Designation is 1 Williams-Federal. Contract is for 9,000 ft.

Great Western Drilling Co., Midland, Tex., is drilling for Three States Natural Gas Co. at 2 Joes Valley, a wildcat test in 23-16s-5e, 5 miles south of Huntington Reservoir, in eastern San Pete County, Utah.

Walker & Wilson tools are under contract for three additional wildcats in Cheyenne County, Nebraska. Two tests

C. G. Glasscock Drilling Co., Corpus Christi, is keeping a rig busy in East White Point field, in San Patricio County, Texas, across Nueces Bay from Corpus Christi, where it is drilling for Republic Natural Gas Co. Shown in the picture, on the rig floor, are: Back row, left to right, L. L. McKinsey, floorman; Joe Hellman, tool pusher; R. A. McKee, floorman; F. L. Drum, derrickman; and, front row, same order, Buddy Hebert, Mission Manufacturing Co.; B. D. Smith and H. E. Koenning, floormen; and T. A. Myers, driller. (Photo by Mission Manufacturing Co., Houston.)

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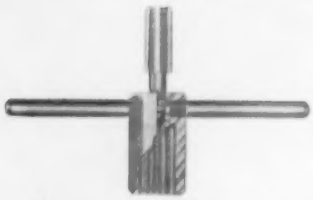

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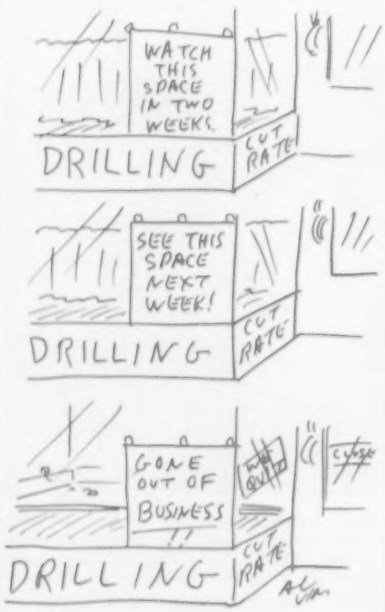
will be for Lloyd R. Magnerson, and one for Don Christopher and Western Nebraska Oil Co. The Magnerson jobs are at 1 State, in 36-15n-48w, south of Franzen, and at 1 Pitman, in 19-16n-49w, 1½ miles north of Gourley. The Christopher and Western Nebraska test is 1 Grabowski, in 17-15n-48w, 2 miles northwest of Cook.

S. D. Johnson, Wichita Falls, Tex., is contractor and joint operator with James Sloss on a new wildcat test in the West Mush Creek area, Weston County, Wyoming. Location, in 2-44n-65w, is 1½ miles north of Wild Horse Butte. Test is listed as 1 Cummings.

Chance Drilling Co., Houston, has a rig working for Standard Oil Co. of Texas at a wildcat location a mile southeast of Fannett, in Jefferson County, Texas Gulf Coast. The test, being drilled as 1 Barnes, is contracted to 10,000 ft.

Bilbo Redding is contractor on a well Oil & Gas Property Management, Inc., is starting on its recently acquired properties in the Cleveland Townsite field, Liberty County, Texas. The well, projected to 9,000 ft., is 1 Clements et al, in the J. S. Boothe Survey, a mile west of the townsite.

Rine Drilling Co., Wichita, Kans., is drilling for Ohio Oil Co. at 1 Bond, a Mississippian wildcat test in Meade County, southwestern Kansas. Location, in 32-33s-30w, is 2 miles southeast of East Kismet field, and 2¼ miles west of Novinger field.



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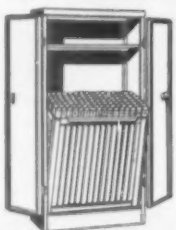

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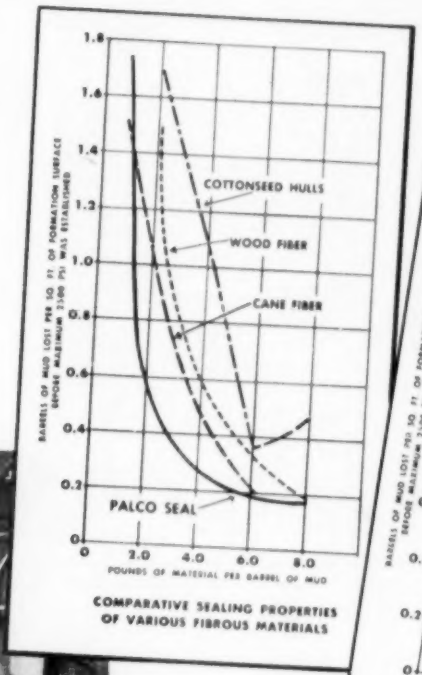
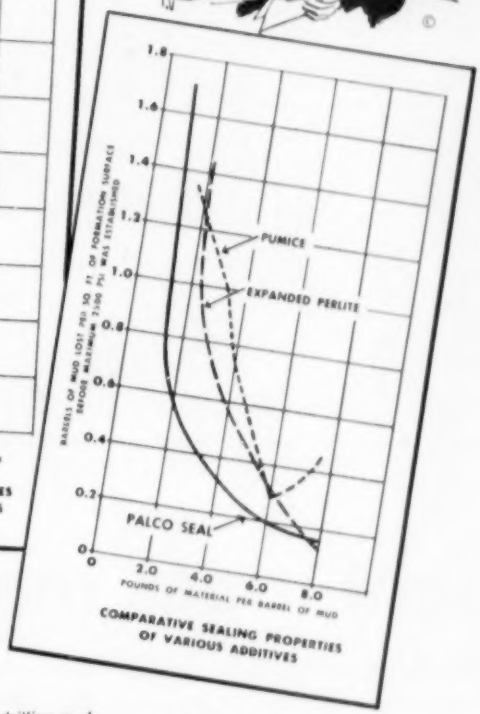


COMPARATIVE SEALING PROPERTIES OF VARIOUS FIBROUS MATERIALS



COMPARATIVE SEALING PROPERTIES OF VARIOUS ADDITIVES

Correlating closely with field experience, graphs above show results of tests in which various amounts of circulation materials were added to drilling mud, circulated for 30 minutes, then pumped through a gravel bed of controlled density. The amount of mud loss before shutoff is plotted against pounds of lost circulation material used per barrel of mud.

Substantiated by field experience in thousands of actual drilling operations, the above graphs show how Palco Seal redwood fibers act more quickly and effectively to reduce circulation mud losses. Palco Seal's controlled combination of long and short fibers forms a dense matted barrier which becomes firmly embedded in the porous strata and fissures or cracks encountered during drilling operations. Complete unifrom sealing is assured by the fact that Palco Seal disperses thoroughly in mud and remains in suspension.

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THE OLD WAY of drafting pipeline alignment diagrams was detailed and time consuming. Even worse, it made it almost impossible to show landmarks and terrain features with a high degree of clarity that could eliminate any possibility of error. Fig. 1.

Eight ideas that saved money for

USEFUL suggestions from employes on a wide range of activities come to Interstate Oil Pipe Line Co. offices as a result of the Coin-Your-Ideas Plan of the company. The purpose of the plan is to stimulate constructive thought on the part of company employes by rewarding them for suggestions leading to improvements in operations, methods, equipment, or in working safety conditions.

All employes of the company, except those in positions equal to or above that of assistant district superintendent or assistant department head, are eligible to participate in the plan. The supervisory personnel mentioned above may be eligible for awards if their suggestions are clearly outside the scope of their work.

All ideas submitted are considered by a committee which determines the worthiness of each and decides on the cash award for the best suggestions. No limit is placed on the amount that may be awarded; thus the amount received by a contributor is based entirely on the merits of his suggestion and its value to the company.

The practical suggestions presented here have been selected from award winners in a recent announcement of the C.Y.I. committee in which a total of $1,000 in awards were granted to 30 employes.

1 Use of aerial mosaics for pipeline alignment sheets and inventory maps was a suggestion submitted by chief draftsman C. O. Branch, Shreveport office, that gained the largest award.

Using the new method, the final line-route is plotted directly on aerial photos, which are available from a preliminary route survey. Section lines, survey stations, and pluses of all types are added directly to the original photo. This composite is then photographed through a mask which shows all other pertinent information, such as title block, section numbers, right-of-way numbers, construction data, coating information, etc. Drafting costs are reduced by this photogrammetric method to less than $20 per sheet.

The old method of recording pipeline routes and right-of-way information, still in use by many companies, has been to plot the line on tracing cloth, then add the section lines, railroads, highways, rivers, towns, and other topographical features. The average drafting cost of one alignment has amounted to $40.

A comparison of the old and new method is given in Figs. 1 and 2. The

THE NEW IDEA, suggested by an Interstate draftsman, plots the final line-route directly on aerial photos available from preliminary route surveys, and this composite is then photographed through a mask that shows both terrain and all pertinent data. Fig. 2.

Interstate Pipeline

line footage covered is the same in both cases and the original scale was 1-in. to 1,000-ft. Title blocks, line information, and right-of-way data normally appear at top and bottom of the sheets but have been omitted in these reproductions.

Besides the saving in drafting cost, the new method of mapping helps to eliminate survey and drafting errors. The line is not only plotted according to bearings and section-corner ties, but is also tied to terrain features, perhaps doubling the number of check points.

Intangible savings will be realized by the field use of the new maps. It can be readily seen that much more accurate and more rapid work is possible when field personnel have a picture of an area instead of a drawing. For example, it is often necessary to inquire locally for information concerning a particular tract of land or an area near a pipeline. With the new maps to consult, those living in a locality will be much more accurate in giving directions, describing property boundaries, pointing out access roads, etc.

Interstate plans to use this method throughout its system and a direct saving of $6,200 is anticipated.

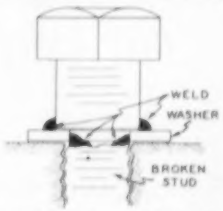
2 Tapping of a main line and the installation of a pressure-actuated relief valve is the basis of a suggestion submitted by T. C. Shaughnesy of the Billings, Mont. district. One of Interstate's lines in this area runs through some valuable irrigated land and a line break and consequent crude spillage onto the land or into the irrigation system would result in heavy damage claims.

The suggested safety measure is to tap the main line upstream from the irrigated portion and install a relief valve. A 4-in. line from this valve would run to a small reservoir. The danger of a line break from pressure surge would then be eliminated from the downstream section. In case of operation of the valve, no crude would be lost because it could be retrieved from the reservoir.

Cost of the installation would amount to about $500, but the potential savings by avoiding damage claims are much more.

3 The easy removal of studs broken off flush with the surface of engine blocks or pump housings is made possible by the use of an idea submitted by J. A. Droddy, mechanic in the Magnolia, Ark. district. Where welding is permissible, this method eliminates the drilling and chiseling out of old studs.

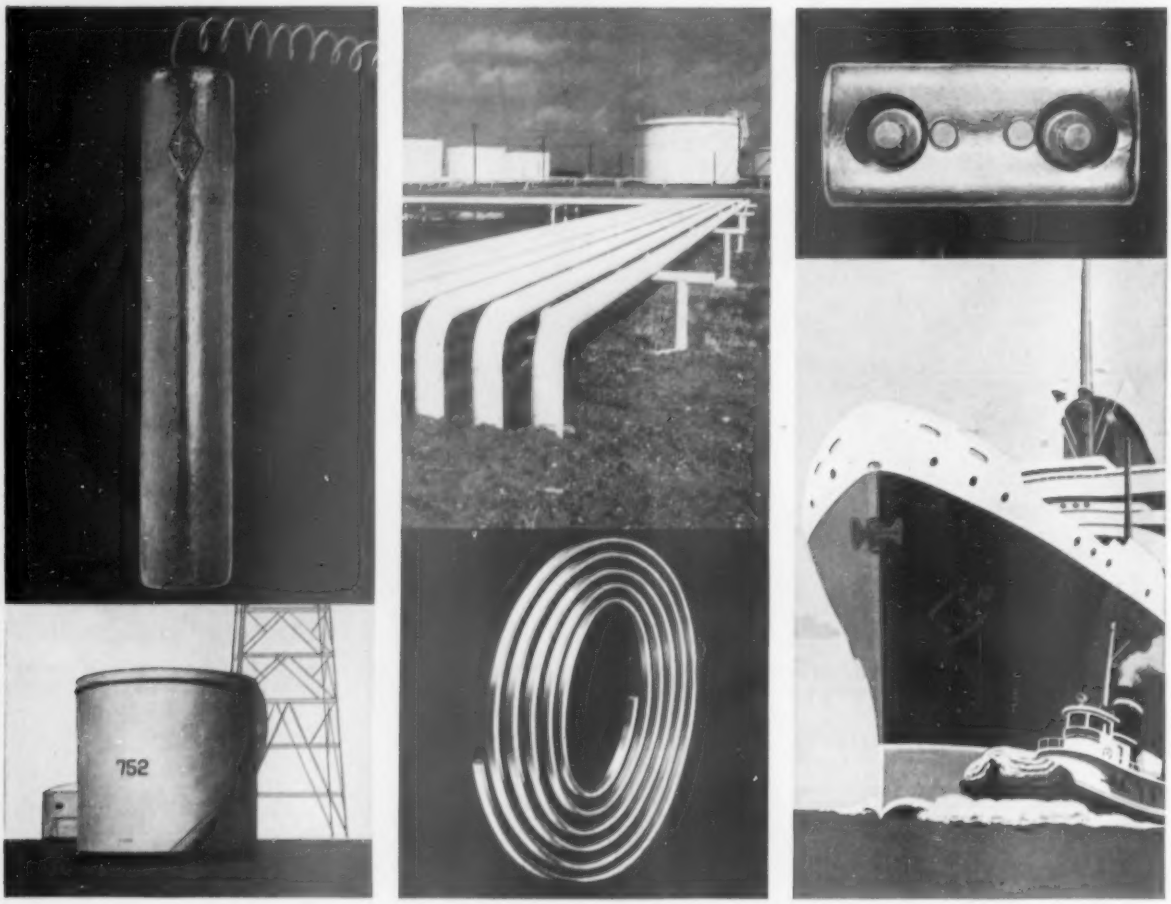
First, a washer is placed over the broken stud and the two are welded together through the center of the washer. Excessive heat is used in welding. Next,



a stud or bolt is welded above the washer so that a wrench may be applied. After cooling, the projecting bolt is turned to remove the stud. Excessive heat used in welding helps to loosen the stud through expansion and contraction. The washer is primarily for protection of the base metal from damage due to welding.

The soundness of the idea has been exemplified in a recent case where 2 hours were spent in uselessly trying to remove a stud with drill and chisel. The stud was then removed in about 10 minutes by the method described.

4 Design of a tool for the setting of expansion anchors won an award for



YOU CAN'T BEAT DOW MAGNESIUM ANODES FOR DEPENDABLE CORROSION CONTROL

Forget about cathodic protection repair bills —install high purity cast anodes and labor-saving ribbon anodes

Once installed, Dow magnesium anodes will never let you down. Throughout their entire life span they never stop providing *dependable*, low-cost corrosion control.

When you standardize on magnesium anodes you can forget about power failures and costly repair bills caused by storms, rodent attack on power leads, and dried-out ground beds. Magnesium anodes provide their own current for continuous cathodic protection.

And now the cost of cathodic protection is sharply reduced, thanks to the new *high purity* of Dow cast anodes. These new anodes last far longer and give you more ampere hours of protection.

Whether underground or marine; whether you require only "hot spot" protection or over-all coverage, you will find there's a Dow magnesium anode designed to solve your particular corrosion problem. For the complete story write THE DOW CHEMICAL COMPANY, Midland, Mich., MA 312J-1.

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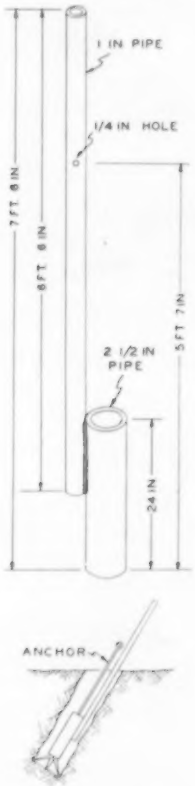
you can depend on DOW MAGNESIUM ANODES DOW

R. C. Norwood of the electrical department, Shreveport. The tool, made from junk pipe, cost about $2 to fabricate

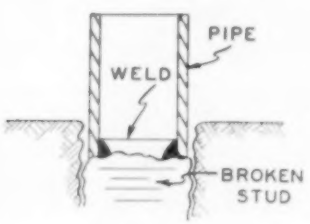


and represents a saving of about $10 over purchased equipment.

The round shape of the tool causes blows on the anchor to be distributed equally around its circumference and causes the anchor to spread evenly and quickly. When using the tool with standard-length anchor rods, a hole in the tool-handle will be even with the rod eye when the anchor is fully extended.

5 **Removal of broken stud bolts** can be accomplished with ease by the use of an award-winning idea submitted by P. J. Madere, Jr., of the Raceland district in Louisiana. His method, which also requires welding, is applicable in cases where bolts are broken off well below the surface of the bolt hole.

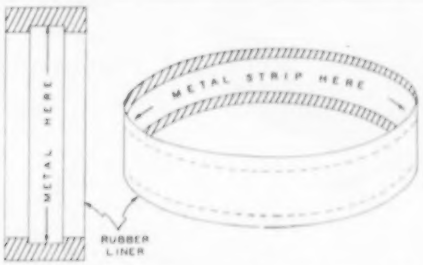
A short piece of pipe, of about the same diameter as that of the stud bolt, is inserted into the stud hole. The pipe is then welded to the top of the broken stud, with the welding being done inside the pipe. A pipe wrench is then used to break the stud loose. Heat from the welding helps to loosen the threads in this case also.



Where a drill is used for removing broken studs, the stud-hole threads are sometimes damaged, making it necessary to weld the new stud in place to prevent leaking. The suggested method eliminates thread damage and the need for welding new studs in place.

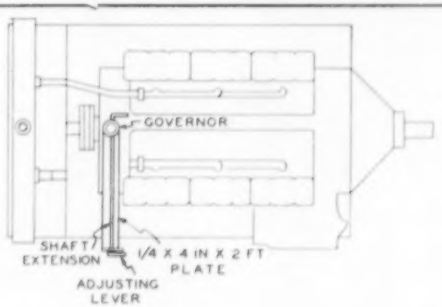
6 **Safety in loading and unloading pipe** is the theme of a device presented by E. T. Upton, utility man in the Wilson district of Oklahoma. This adjustable-length skid can be set for the correct length to reach from truck to rack or from rack to rack. Time is saved in spotting trucks beside racks, and unsafe, makeshift skid arrangements are eliminated.

The skid is fabricated from 2-in. and 2½-in. pipe and it is pinned together at the desired length. Quarter rounds of 4-in. pipe are welded to each end of the skids to give a secure fastening to the truck bed and to the pipe rack.



7 **Prevention of ruptures in rubber liners used in bolted pipe couplings** can be achieved by the use of a metal reinforcing strip, according to M. N. Carroll, gager in the Shreveport district. Failures in this type of coupling are usually caused by improper fitting of the bolted clamps in the original installation. This causes a pinch or wrinkle in the rubber liner and failure follows shortly afterwards.

The preventive measure is to cut a narrow strip of metal, usually from an old oil can, and place it in the recess inside the rubber liner. Carroll reports that this increases the life of the coupling and boosts its pressure rating by 100 per cent.



8 **Design of an extension governor control** for a large gas engine put the name of F. R. McCleskey, station engineer in the Wilson district of Oklahoma, on the list of award winners. On this particular engine, the governor-control lever is located immediately behind the engine fan and between the cylinder banks. In making the extension, a steel plate, ¼-in. by 4-in. by 24-in., is bolted to the governor housing so as to project horizontally from the engine. The adjusting lever, spring, and quadrant bracket are then removed from their position on the governor and bolted to the outboard end of the plate. A ½-in. shaft is then installed to couple the lever to the governor.

The modification provides a safe, convenient method of changing the governor setting. It eliminates the hazard of operators having their clothing or hand caught in the fan pulley and also removes the danger of operators being burned by contact with the exhaust manifold.

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FOLD-BACK FACE SHIELD

Extends head protection to face and eyes—folds back when not in use. Fits McDonald "T" and "P" type hats.

Ideal for use on dam, tunnel, oil field and other big construction jobs. Standard size 9" long—also available in 4" & 6" lengths. Made of clear transparent plastic, .040 thick.

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PIPELINE PATROL

WELDING CREW cuts through scrubber walls with torches.

On-site revamp

THE ingenuity of a compressor department crew in rebuilding worn scrubbers, or gas cleaners, at five Texas Gas Transmission Corp. compressor stations, has been credited with effecting a sizable savings in time and money.

The crew's formula for economy was to do the complicated and difficult job in the field, instead of removing the scrubbing units to a fabricating plant where such work had been done under previous methods.

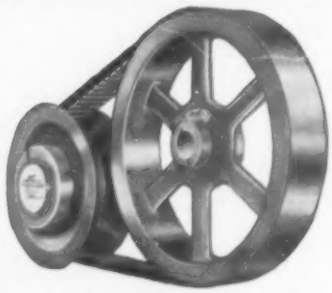
A Texas Gas crew cut through the 1⅛-in. walls of the dry-type scrubbers with welding torches. Inside, they found that particles of residue dirt had worn holes in the separators.

To make the scrubbers serviceable for years to come, the crew replaced the worn separators, some 84 to each vessel, with separators of a heavier material.

The units were back in service long before the fabricating plant could have completed and shipped them for installation.

REPLACING the old separators with new, heavier-built units.

Where minute speed adjustment is needed . . .



Specify Wood's New Variable Speed Drive

Here's an economical variable speed drive that can be adjusted for infinitely variable speed within its range. By simply turning an adjusting screw on either side of the variable pitch sheave, both flanges move simultaneously and speed changes are obtained quickly and easily.

Positive clamping of the two adjustable flanges eliminates fretting corrosion. Single wide range belt for motors 5 to 20 horsepower provides speed range ratios up to 3 to 1 . . . no lubrication . . . less shaft overhang . . . much less vibration than multiple groove variable speed drives because there's no matching of belts . . . sensibly priced and economical in operation . . . send for Bulletin 796 for detailed information.

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EQUIPMENT MEN . . . in the News

Rockwell Promotes Two To New Sales Positions

J. H. WALTERS

T. I. STACY

Jack H. Walters, Houston district sales manager of Rockwell Manufacturing Co.'s Meter and Valve Division since 1951, has been named gas products manager for the entire division and will make his headquarters at the company's home office in Pittsburgh, according to Lloyd A. Dixon, Jr., vice president.

Thomas I. Stacy, a sales engineer in the Houston district since 1940, will replace Walters as district manager.

Walters joined Rockwell in 1943 as a sales trainee in the Houston office. From 1948 to 1951 he served as a sales engineer covering the Lake Charles, La., area.

Stacy joined Rockwell in 1938, and after spending 2 years as a shop worker and serviceman at the Instrument Division plant at Tulsa, he was promoted to sales engineer in the Houston district.

Gardner-Denver Announces Key Personnel Changes

Charles M. George, for 25 years a member of Gardner-Denver Co., has been appointed assistant to President G. V. Leece, and J. W. (Jack) Gardner, who recently was elected to serve as a member of the board of directors, has been appointed administrative assistant. The company has also announced the promotion of B. P. (Doc) Spann to vice president, and George W. Gutekunst to general sales manager.

George joined Gardner-Denver in 1929. In 1943 he was made assistant sales manager of industrial sales, and in 1948 was promoted to sales manager of that division. In 1950, George became sales administrator, a position which he occupied until his recent appointment.

Gardner has been with the firm since 1947 when he joined the sales force operating from the Los Angeles office. He was transferred to the executive office in Quincy, Ill., during 1952, where he served in various capacities in the engineering department before assuming his present position.

Spann, who has been with the company for 20 years, has been director of personnel the past 8 years, and previously was in charge of advertising.

Gutekunst, formerly district manager for Gardner-Denver in Los Angeles, will now headquarter in the executive offices in Quincy. He will replace Leece, recently elected president of the company. Gutekunst joined the sales force in 1937, and in 1947 was transferred to Los Angeles, where he is well known to oil and construction men.

Schluz is Sales Engineer In Welex San Angelo Area

E. B. Schluz has been appointed sales engineer in the San Angelo, Tex., office of Welex Jet Services, Inc., the oil-well servicing company has announced. Schluz served as sales administrative assistant in Fort Worth and in the field for the past 2½ years. He joined Welex Jet as a trainee after his graduation from Texas A. & M. in 1952.

Orbit Transfers Soape To Houston Branch Office

R. H. SOAPE

H. M. JOHNSON

Ralph H. Soape, Orbit Valve representative at Corpus Christi, Tex., for the past 3 years has recently been transferred to Houston to work out of Orbit's branch office there. Howard M. Johnson replaces Soape as Southwest Texas representative for Orbit. Johnson will headquarter at Corpus Christi.

Prior to coming to Orbit, Johnson represented Rector Well Equipment Co. in Southwest Texas for 3 years.

A. C. Murphy Made General Manager, Frank W. Murphy

A. C. MURPHY

Art C. Murphy has been promoted to general manager of Frank W. Murphy, Manufacturer, Tulsa, maker of a line of safety switches for the petroleum industries.

Art Murphy joined the company in 1952 as a design engineer, and has worked in both the production and sales departments. He worked for Sinclair Oil & Gas, Tulsa, until 1936 when he joined the engineering department of Southwestern Bell Telephone Co., which he left to join his brother, Frank, in the safety control business.

E. L. DeGolyer Elected to Dresser Industries Board

E. L. DeGOLYER

Election of E. L. DeGolyer, internationally known petroleum geologist and oil executive to the board of directors of Dresser Industries, Inc., Dallas, manufacturers of oil, gas, and chemical equipment, has been announced by H. N. Mallon, president.

DeGolyer, an outstanding petroleum scientist, has also had a distinguished business career and has made a most significant contribution to the growth of the oil and gas industries.

DeGolyer is a senior member of the consulting firm of DeGolyer & MacNaughton, Dallas. He is a director of First National Bank of Dallas, Louisiana Land & Exploration Co., Republic Natural Gas Co., Texas Eastern Transmission Corp., Southern Pacific Co., and Great Plains Development Co.

Aerofin Corp. Moves To New Syracuse Plant

To take care of increased heat-exchanger production required by the expansion programs in the petroleum and process industries, Aerofin Corp. has moved to a new plant in Syracuse,

ONE OF A SERIES

OF SHOP TALKS

BY

JOURNAL EDITORS

Why does the Journal print so many statistics?

The barnstorming pilot of the 1920's flew "by the seat of his pants," but it takes a cockpit full of instruments for the modern plane.

An oil business can't be run by hunch today, and statistics are the instruments which reveal changing conditions and indicate the adjustments in operations needed to keep on a successful course.

The oil industry has better statistics on supply, demand, and activity in its various components than any other major industry. And the Journal prints these statistics every week—while they're current and useful—in a special five-page section.

In addition, the Journal carries several monthly series, has special review and forecast issues every January and July, and carries many articles on significant industry trends throughout the year.

Statistics are dry stuff? Not the way the Journal presents them, in easy-to-read charts, summary tables, and explanatory text. Our statistics are selected and tailored to be of particular use to operating oil men. Our economics editor makes it his full-time job to interpret important data in terms that you can understand and use.

Some of our statistics are original with the Journal, collected and compiled by our own staff. Others are from Government and industry sources, selected and arranged to give a complete and balanced picture of what the industry is doing and where it is headed.

Big oil companies have economics departments to analyze and interpret statistics for management and to advise on the timing and direction of current operations and future plans. Smaller operators get the same basic data from the Journal, and our trend charts and our economic discussions help them in their planning.

Today, large and small companies in every branch of the industry are watching current data as a guide to operating decisions more closely than ever.

That's why the Journal prints so many statistics.

THE OIL AND GAS JOURNAL

N. Y. The new plant contains 80,000 sq. ft. of production space on one floor, and occupies a 6-acre plot adjacent to the New York Central main line.

The entire plant will be devoted exclusively to the manufacture of extended heat-exchange surface which Aerofin has manufactured exclusively since 1923.

Taylor is North Texas Manager for Stentz

F. W. TAYLOR

The appointment of Foy W. Taylor as manager of the North Texas division was announced recently by S. L. Stentz, president of Stentz Equipment Co. Taylor has had extensive experience in industrial machinery sales throughout North Texas. The last 3 years he represented Oil Field Truck Equipment in the sales department.

In his new position, Taylor will have charge of the Odessa warehouse and field operations in the Permian basin, as well as supervision of the division office at Dallas. Taylor succeeds A. W. Tweelings.

Sanford Made Plastic Pipe Sales Engineer

Promotion of Ward B. Sanford to sales engineer of plastic pipe was announced recently by Minnesota Mining & Manufacturing Co.

Sanford will be responsible for the investigation of potential markets for plastic pipe, supervision of field-test installations, and for introductory sales. He joined M. M. & M. in 1949 as management trainee. Since 1952 he has has been a mechanical engineer in the defense products department of the new products division.

Gardner-Denver Elects J. W. Gardner Director

John W. Gardner has been elected a director of Gardner-Denver Co., manufacturer of compressors, pumps, and rock drills for the mining, petroleum, and construction industries, according to Gifford V. Leece, president.

Gardner joined the company's Los Angeles sales division in 1945, and in 1951 was transferred to its executive offices in Quincy, Ill. At present, Gardner is employed in the engineering development section, relative to new industrial applications for Gardner-Denver's products.

Nash to Represent Weco In Rocky Mountain Area

G. L. NASH

Glenn L. Nash has been appointed Well Equipment Manufacturing Corp. sales representative in the Rocky Mountain area, according to an announcement by John W. Gates, sales manager. Nash will make his headquarters in Denver.

Nash has for the past several years been with The D. Miller Drilling Co., Inc., operating in Illinois, Indiana, Kentucky, Nebraska, and Colorado. Prior to that time he was with The S. R. Hardin Drilling Co., operating in Kansas.

Before assuming his new duties, Nash had completed an extensive program in the Weco plant at Houston, familiarizing himself with the complete line of Weco unions, blocks, and compounds; Chiksan swivel joints and steel rotary hose.

Texas Pipe Bending Co. Occupies New Building

Texas Pipe Bending Co. has occupied this new office building in Houston, according to James A. Beeley, president of the firm. The new building is on a 13-acre tract at the intersection of the Old Galveston Highway and the LaPort Expressway. With this move into new and larger quarters, the company is also consolidating Plants No. 1 and No. 2 at the new location. The office building area is 9,000 sq. ft. Included in the building are two executive offices, a conference room, drafting room, blue print room, bookkeeping department, file room, and a great many other individual offices for department heads and secretaries. In conjunction with the office opening, and plant consolidation, the company has greatly increased its facilities. The plant has doubled its welding capacity and has installed considerable new-model welding machines. New X-ray equipment has been installed in the plant's X-ray lab for the purpose of checking welds to determine quality.

Well Equipment Transfers Viator to Lafayette, La.

Joe Viator is being transferred from Shreveport to Lafayette, La., according to an announcement by John W. Gates, sales manager, Well Equipment Manufacturing Corp.

This transfer puts Sales Representative Viator back in a familiar territory of South Louisiana, where he was at one time representative for Bethlehem Supply Co.

Bauer is Sales Manager for De Laval Steam Turbine Co.

H. G. BAUER

H. G. Bauer has been promoted to the new post of vice president and general sales manager by De Laval Steam Turbine Co., Trenton, N. J. In his new duties, Bauer will assume supervision of all company sales activities. Bauer's previous duties were those of vice president in charge of engineering and manager of the Marine Division.

W. A. Neumann has resigned as vice president in charge of sales at De Laval to assume new duties as executive vice president and treasurer of De Laval Separator Co.

Bauer joined De Laval in 1937 after extensive marine engineering and shipbuilding experience in Europe and in this country. He received his technical education in Europe and is a graduate of Technische Hochschule, Hanover, Germany. Bauer has been associated with the Marine Division since he joined the company, and was appointed manager of the Marine Division in 1946. In 1948 he was appointed executive engineer, and in 1949 elected vice president of engineering and continued in the capacity of manager of the Marine Division.

Dehlendorf Made Motor Division Sales Manager

Appointment of Robert O. Dehlendorf as assistant general sales manager of the Electric Motor Division of A. O. Smith Corp., with headquarters at the Dayton, Ohio divisional office has been announced.

Dehlendorf has been with the Chicago district office of the company for the past 4 years, and was with Jack & Heintz, Inc., previously as district sales manager for motors in New York.

They don't come too big for TAYLOR FORGE

As pioneers in the making of heavy-walled large-diameter pipe, it is not surprising that Taylor Forge has developed the widest range of large welding fittings and flanges like those illustrated here.

In fact, those who know the background of Taylor Forge insist on the WeldELL® line for all requirements from smallest to largest. They have found that WeldELLS have features which are combined in no other fittings for pipe welding.

See your Taylor Forge Distributor for up-to-the-minute facts.

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Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada

The pipe was farther along than the auto!

They made their automobiles high in the days when this photo was taken at the old Taylor Forge Works, and that's why Taylor Forge chose this way of demonstrating the largest heavy-walled pipe the world of 1916 had ever known.

As a matter of fact, the pipe was farther along than the automobile; for Taylor Forge had started the manufacture of this large pipe as early as 1907. Before then, pipe had been just a tube for conveying fluids, but by 1907 there was a widespread call for large, rated pipe to withstand widely varied and exacting services.

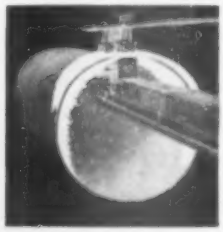
Taylor Forge responded to this call. In pioneering forged steel flanges, Taylor Forge had learned a lot about forging technique and piping practice...and both schoolings were prerequisite to the new venture. The projected large diameter pipe was to consist of heavy plate rolled into shape, then hammer lap welded to a smooth, sound weld. This called for heavy, specially designed equipment to make the process work and to provide the first *smooth interior* pipe and pressure vessel cylinders produced in this country.

Typical of the pioneering obstacles was the need for a clean flame to prevent scale forming at the weld, but this problem was solved when Mr. J. Hall Taylor designed and installed a large water gas plant that provided the desired welding conditions.

Thus it was that by 1916 Taylor Forge was making pipe up to 96"; forging all types of end joints on it; engineering it and prefabricating it into hydro-electric penstocks; laterals and Y's for pumping stations, pipe lines, and for similar applications all over the world.

Since the introduction of automatic metallic arc-welding this large pipe has been produced as "Taylor Straight Seam Electric-Weld Pipe," but there are hundreds of miles of the old "Taylor Hammer Lap Welded Pipe" still giving as good service as it did the day it was installed.

An episode in the story of Taylor Forge leadership in designed piping



This old painting—the original in full color—depicted the original process of making Taylor hammer lap welded pipe.

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. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller

New Pressure Transformer Works Without Friction

The E-80 Sensater is a different kind of pressure transformer for Type D and E weight indicators. The Sensater slips into the Ideal wire line anchor just like the familiar Type D piston. It develops a stroke equal to a piston's travel; it can withstand tremendous pressure; and it is unaffected by temperature and fluid changes.

The Sensater is a diaphragm-type pressure transformer that works absolutely without friction. Because the Sensater has no piston rod, problems of wear, friction and piston-rod corrosion cannot exist.

The Sensater derives its accuracy and sensitivity from mobile diaphragm that does not deflect like ordinary diaphragms, but always moves with its backing plate. Consequently, the area pushing against the hydraulic fluid remains constant, always transmitting direct, no-lag signals to the weight indicator gage. The Sensater is designed for years of rugged, trouble-free operation and to give the ultimate in weight-indicator accuracy. *Martin - Decker Corp.*

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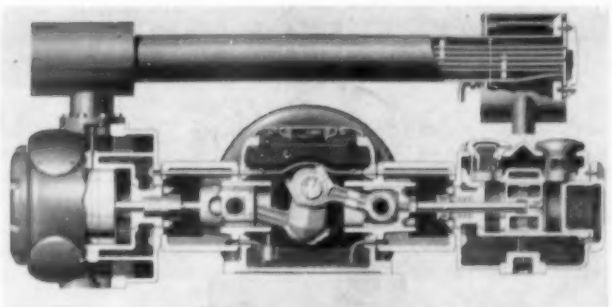

New Compressor Requires Little Space

A packaged air compressor in the 75-100-hp. range that approaches the good efficiency and economy of larger, more powerful, slow-speed compressors is called the PHE. The new machine is an opposed-cylinder, balanced design driven by a direct-connected, induction motor. It is a packaged, ready-to-run, heavy-duty unit, arranged in single or multistages. The basic design is a two-stage unit for 80-125 psi., but other cylinder arrangements are available for higher pressures or for pumping vacuums.

The PHE requires very little floor space, a simple foundation, and a minimum of piping and connections. The design of the running gear is such that the bearings literally roll with the punch. The full - floating aluminum bearings rotate slowly thus taking the major thrust of each succeeding stroke on a different portion of the shell. All three main bearings are interchangeable. This type of bearing has been proven by actual performance in the PRE, XLE, and XPV compressors as well as in the company's S and TS diesel engines.

Piston and rod assemblies of equal weight, moving in opposite directions on an 180° crank, balance out all primary and secondary inertia forces without the use of counterweights. The crossheads are of the aluminum piston type. *Ingersoll-Rand Co.*

Check No. 2 On The Time Saver Card

Magnalux Gage Easily Installed on Tanks

Magnalux is an improved type of automatic reading gage to show the height of any liquid including liquefied gases stored under pressure. It can be used on existing tanks without the necessity of cutting holes or other openings in the tank itself. It is an externally connected instrument that is simple to install.

Magnalux consists of a nonmagnetic column that is connected to the liquid and vapor space of the tank. Within this column a float is free to rise and fall.

As the liquid in the tank changes in level, the liquid flows through a connecting tube to the column and levels out in the column itself. The float, which has a magnet connected to it, follows this change in level and the field from the magnet positions a roller on the outside of the nonmagnetic column. The indicating roller is enclosed within a plastic raceway filled with an inert gas. On each side of the raceway are placed scales that can be graduated in feet and inches, gallons, or any other convenient unit of liquid measure. Thus, the operator can see

at a glance the exact amount of liquid stored within the tank.

There is no possibility of either liquid or vapor escaping from the tank as the tank seal is a solid wall of non-magnetic metal and this wall can be made as thick as required for any pressure. This gage can be furnished with switches to actuate audible or visible alarms, or to control pumps or valves. *Liquidvision Gage & Control Corp.*

Check No. 3 On The Time Saver Card

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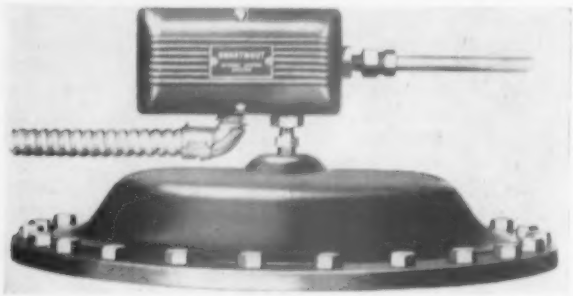
New Power Relay Eliminates Lag



A new power relay eliminates transmission lags common to pneumatic systems. The Autronic Type P2R power relay, an electro-pneumatic transducer is designed to operate with the Swartwout Autronic control system. It takes the electrical output from the Autronic controller or manual control and converts it to an air-loading pressure proportional to the electric current.

This makes it possible to utilize the low cost and flexibility of air-operated valves without the transmission lags normally encountered in all-pneumatic systems. No electric motors, boosters, or slide wires are employed. The equipment can be made explosionproof.

Process variables are converted into small a.c. voltage by the primary element transmitter and acted upon by a selective wide range of control actions in the controller. D.c. output of the controller, which is transmitted to the power relay, is of a value which is fundamentally governed by the primary-element transmitter, but which is continuously modulated by the proportional, reset, and rate-time actions of the controller. Large mechanical power amplification at the final control element is obtained by the P2R power relay. *The Swartwout Co.*

Check No. 4 On The Time Saver Card

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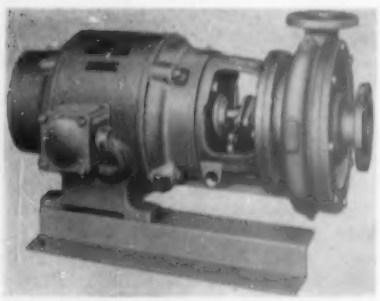

Pump Offers Custom Ordered Components

A new series of production-built, centrifugal, 1,750-r.p.m., single-suction pumps are available in sizes ranging from fractional flow to 600 g.p.m. Units are available from stock constructed entirely from Ampco alloys or nickel-chrome alloys to combat the effects of corrosion and erosion. They are particularly designed to transfer liquids that are normally difficult to handle because of their erosive and corrosive nature.

Pump components may be easily interchanged to fit the requirements of various specialized jobs, thus permitting the customer to satisfy all the requirements of his operation and get a pump that is tailor-made for his job. The customer can specify the type of lubrication and bearings best fitted for his job. He can choose the type seals and impeller he needs. This new pump also gives him a choice of several shaft constructions and two pedestal heights.

Pumps constructed from Ampco alloys are noted for exceptional resistance to erosion, corrosion, and cavitation. The ability to withstand these destructive forces, plus excellent hydraulic design, provides attention-free pumping of many liquids normally considered difficult to handle, including those having abrasive solids in suspension. *Ampco Metal, Inc.*

Check No. 5 On The Time Saver Card

●

400-Ton Crown Block Gives High Weight/Strength Ratio

A new 400-ton crown block is a companion to the 400-ton "Big Shorty" traveling block with sheaves and bearings completely interchangeable. The new 400-ton series can be furnished as either a six or seven-sheave block having 50 or 60-in. diameter sheaves. An option of 1¼, 1⅜ or 1½-in. groove size is offered. Weights vary from 6,835 to 8,300 lb. depending on the number and diameter of sheaves. All-steel fabricated construction of the streamlined base gives a high ratio of strength per pound of weight.

The new blocks are equipped with 10-in. diameter center pins and heavy-duty double-row Timken tapered bearings. Each sheave bearing is individually lubricated by an Alemite fitting located at the end of the center pin. The Fabriform sheaves are used because of their greater strength, hot roll-forged rim and groove, freedom from shrink-pockets and sand holes, and inherent dynamic and static balance. All sheave grooves are flame-hardened for long life. *Ideco, one of the Dresser Industries.*

Check No. 6 On The Time Saver Card

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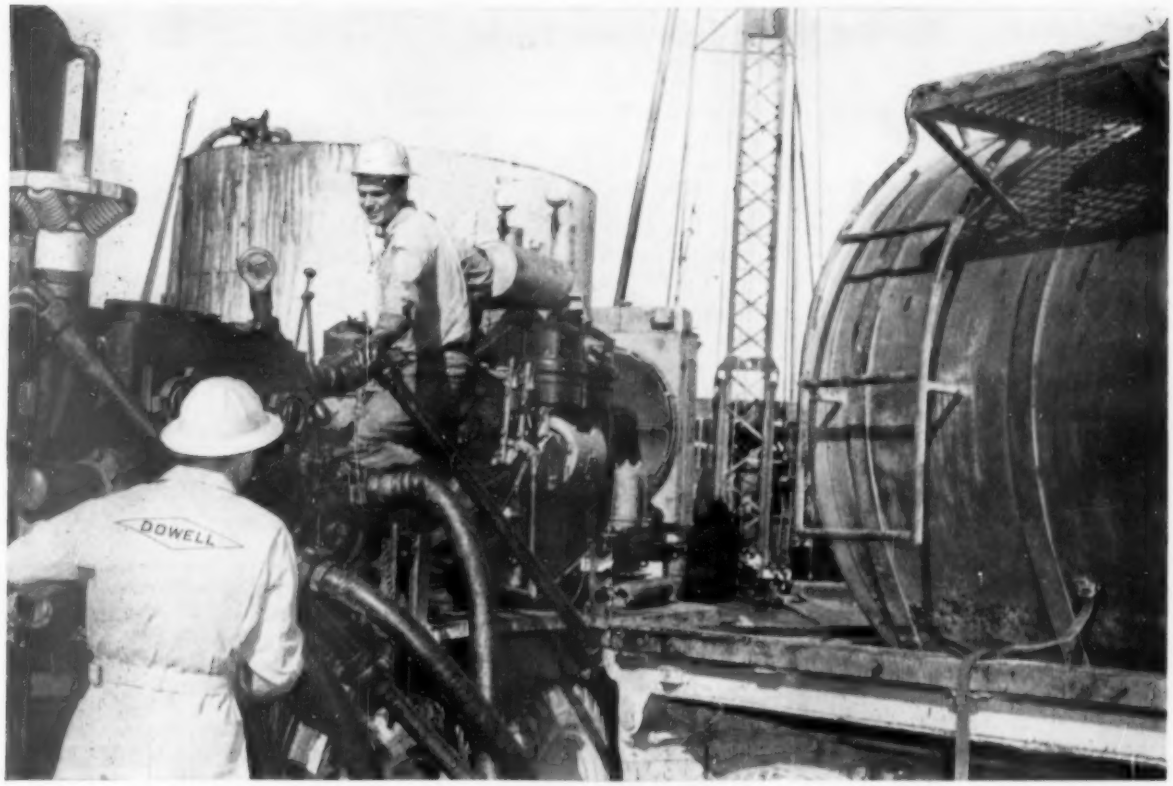
Sand Filter Offers Protection to Pumps

A new sand filter, the Sure Flow, which takes the place of the perforated nipple on a production string, offers protection to pumps. Tests have shown that Sure Flow removes from crude the



FIXAFRAC

AIDED FRACTURING TO INCREASE PRODUCTION

DOWELL Temporary Plug sealed porous zone permitting successful retreatment

---

Fixafrac*—a temporary plugging service performed by Dowell—may provide the means of successful retreatment where initial fracturing or acidizing has been unproductive. Dowell uses Fixafrac material to divert the treating fluids into different sections of the pay by sealing off unproductive, depleted or previously treated zones. The material used carries suspended solids which react after a short time causing the Fixafrac to liquefy and flow back freely to the well bore.

Here's a case where a new well failed to produce oil in commercial quantities. A fracturing treatment by another service company got no results. Dowell engineers, called on the job, recommended Fixafrac followed by a Stratafrac* treatment. After this service, the well flowed 13 barrels of oil per hour, according to production tallies.

This is only one of the many cases where Dowell Service has paid dividends to the operator. You, too, may profit from Dowell's long experience, expert know-how and specially designed, heavy-duty equipment. For further information, call the nearest Dowell office or write DOWELL INCORPORATED, Tulsa 1, Oklahoma, Dept. H-11.

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What's New... Use the handy Time-Saver Cards

sand and other harmful abrasives that damage suction cups, balls and seats, and steel rings of pumps.

Fabric of the filter is of a special weave. It eliminates sanding-up, costly pulling jobs, rod stripping, and production stoppages. Acids will not damage the unit, and it can safely withstand temperatures up to 1,200° F. *Production Specialties Co.*

Check No. 7 On The Time Saver Card

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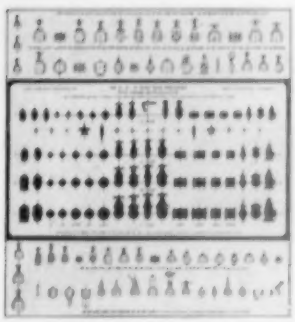

Template Cuts Time In Drawing Valves to Scale

Drafting templates cut time and cost in drawing standard and special duty valves. The template is accurately made to scale for industrial and commercial pipeline drawings. Small valve indicator No. 255 and large valve indicator No. 257 are used for ⅛, ¼, and ½-in. scale, for indication of true and accurately drawn-to-scale pictures of any type valve, with variable pipe connections.

Actual size is 5⅜ by 9⅞ in., and it is made of rigid Vinylite that stays flat with nonglare and nonslip surface. *Graphic Indicator Co.*

Check No. 8 On The Time Saver Card

●

PH-6 Tubing Joint Made For High-Pressure Demands

The Hydril PH-6 tubing joint is designed to meet high-pressure demands. A recent series of tests has proven it to be pressure-tight at 15,000 psi. under drastic and repeated temperature changes. The PH-6 joint was tested to 15,000 psi. gas as follows:

The complete joint, some samples with light oil lubricant and some with zinc-base thread dope; the outside seal only, some samples with light oil lubricant and some with zinc-base thread dope; the inside seal only, with light oil lubricant; the inside seal only, with zinc-base lubricant.

In all tests, the Hydril PH-6 tubing joint proved to be pressure-tight to 15,000 psi. and higher. These tests also proved that either the inside seal alone or the outside seal alone is a 15,000-psi. gas pressure seal. *Hydril Co.*

Check No. 9 On The Time Saver Card

●

Receiver-Integrator Also Operates Small Counter

A new receiver-integrator for graphic panels has just been introduced for use with the company's line of compact Consotrol instruments. A pneumatic-electric instrument, the new Type 224 receiver-integrator computes an accurate and continuous total of any process flow and operates a small counter located in the graphic display.

The integrator consists of two small, self-contained units; a remote counter

and a flow receiver. The counter can be mounted on the front of a panel, usually in conjunction with a Consotrol strip-chart flow recorder. It totalizes to eight digits (or to six digits with zero reset wheel) yet occupies only 3¼ by 5½ in. of panel space. The flow receiver unit, composed of a receiver bellows and a cam-switch assembly, is housed in a small metal box behind the panel.

In operation, pneumatic measurement signals of 3 to 15 psi. from a flow transmitter at the process are received by the bellows which then positions the cam-switch mechanism. The cam-switch, in turn, produces an electric impulse to actuate the counter in precise and constant relation to the flow measurement. Integrators are available for uniform or square root scales to totalize minute, hourly, or daily rates. Service calibration checks can be made during actual operation with no extra equipment required. *The Foxboro Co.*

Check No. 10 On The Time Saver Card

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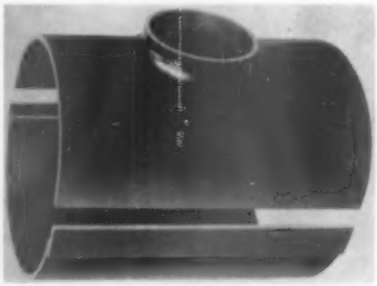

Hot Taps Made Stronger With Newly Designed Saddle

A full-encirclement saddle represents a marked improvement over the conventional saddles employed in the hot tapping of petroleum piping, when branch connections are to be installed. The research prgram entailed the use of pressure pulsating equipment. The pulsation tests approximated the variations in pressures usually found in cross-country service, and they give petroleum engineers an accurate yardstick for judging the relative merits of welded branch connections.

The full-encirclement saddle provides the 360° reinforcement for dealing with high pressure sand large-diameter pipe and taps. When used with high-yield-strength pipe, the elimination of welding between the reinforcing member and the run pipe precludes the possibility of failure due to underbead cracking or to local stress concentration.

The new saddle is designed for use with either high-yield-strength thin-wall pipe, Grade B 35,000 or 42,000 yield-strength pipe, and also for use with heavy-wall cylinders employed for suction and discharge headers, bottles, and pulsation dampeners in compressor stations. It is available in standard and special sizes through 42 in., and in all straight and standard reducing outlet sizes.

The saddle is split longitudinally, on a horizontal plane, perpendicular to the axis of the outlet, thus eliminating welds in the critical crotch area. When clamped to the pipe, the two halves of the saddle are joined firmly by longitudinal straps. If the straps are shop-welded to the bottom half of the saddle, only one field weld on each side is necessary in addition to the weld between the outlet of the saddle and the branch outlet. *Tube Turns.*

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They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

DO Solenoid Valves, a new four-page Bulletin M-500, covers design and performance characteristics of a line of DO (diaphragm - operated) solenoid valves. This two-color bulletin contains photographs, line drawings, specifications, and tables. The complete DO solenoid valve line, available in six pipe sizes from ⅜ to 1½-in., is illustrated. Cross section views show open and closed positions of the valve's only two moving parts, the solenoid plunger and synthetic rubber diaphragm. Other drawings give over-all valve dimensions. *Eclipse Fuel Engineering Co.*

Check No. 12 On The Time Saver Card

●

Stainless Steel Welding Electrodes. Bulletin No. WE-166 is believed to be the most complete manual of its type and is particularly useful to those engaged in welding of stainless steel. The 24-page booklet covers the metallurgy of stainless steels, provides a stainless-steel electrode selector table, and offers other valuable tabular material on welding processes as related to varying chemical composition involved with types of stainless steels. *A. O. Smith Corp.*

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●

Warren Cradle-Mounted Compacunits. Four-page, two-color Bulletin 247 covers cradle-mounted Compacunits Types CLFC, CLC, CMC, and CHC. It includes basic design and construction features; sectional and external views; and composite dimensions; material specifications; and other technical information. *Warren Steam Pump Co., Inc.*

Check No. 14 On The Time Saver Card

●

Cat Diesel Engines Plus Hydraulic Torque Converters. Eight money-making features of a variety of diesel engine applications are described in this new 16-page booklet. Form No. D457 contains job descriptions and numerous photographs of some of the many applications where torque-converter-equipped diesel engines have proven themselves profitable. Included are descriptions of installations in various types of equipment such as cranes, drilling rigs, and shovels, and a complete chart of cat diesel engines and their horsepower ratings. *Caterpillar Tractor Co.*

Check No. 15 On The Time Saver Card

●

Package Unit Steam Generators. Bulletin PSG-1, an 12-page, illustrated booklet covers design and construction details of a series of steam generators. Capacities, dimensions, and weights are tabulated for a capacity range from 10,000 to 30,000 lb. per hour. Automatic controls and instrument panels are also described. *Henry Vogt Machine Co.*

Check No. 16 On The Time Saver Card

●

Fractionation, Absorption, Extraction, Distillation, and Evaporation, a data sheet, describes facilities, personnel, and services offered by a supplier of complete operating units including major equipment, instrumentation, auxiliaries, layout, structural steel, piping, and wiring. *Process Plants Engineering Co.*

Check No. 17 On The Time Saver Card

●

Pneumatic-Operated Control. Bulletin No. 5421 should be of special interest to consulting engineers in the fields of water treatment and waste treatment. It describes control devices and instrumentation in pneumatic-operated control systems and designates the applications to which the system is applicable. *General Filter Co.*

Check No. 18 On The Time Saver Card

●

Cold-Frac Without Hydrate Inhibitor. The 12-page Catalog No. 33-01, prepared in nontechnical language, includes complete information on the Model MDH low-temperature separation unit. Line drawings and photographs fully illustrate the unit. *Black, Sivalls & Bryson, Inc.*

Check No. 19 On The Time Saver Card

●

Flanged Silent Check Valves for the control of water hammer are the subject of a new four-page Bulletin No. 654. In addition to technical descriptive data the bulletin includes a series of dimensional charts for valves of various sizes and pressure ratings. The *William Gauge Co., Inc.*

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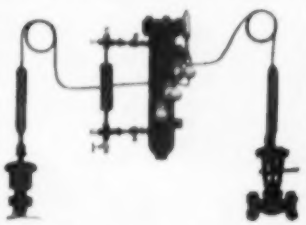

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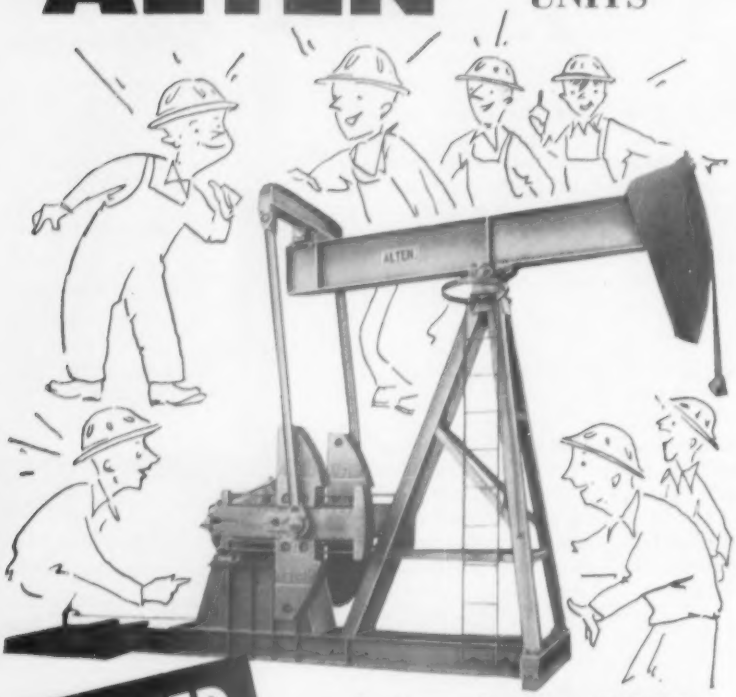
Why all the TALK about ALTEN PUMPING UNITS



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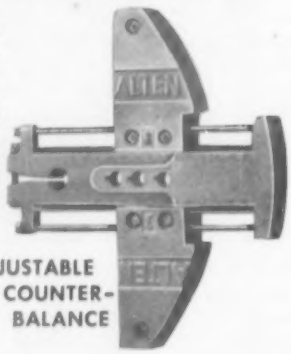
Oil fields are buzzing about the performance records being established by the new Alten pumping units. The answer? *More pumping time!* An Alten unit is more than a green-painted, orange-trimmed steel structure. Take a close look and you'll find a carefully engineered machine. All parts have been ingeniously designed for longer life and quick, easy servicing. *Alten now makes every size and makes it better!*



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Some pumping situations demand herringbone gears for peak performance, others helical. *Only Alten offers both.* No need to compromise — get the proper gear train every time.

NEW ADJUSTABLE COUNTER-BALANCE

Rugged enough to meet harshest oil field requirements, yet so amazingly simple it can be adjusted in minutes by one man on the ground.

Crank calibration locates weights for desired counterbalance. Weights cannot fall during adjustments — they are safely locked in position at all times.

4 WAY ADJUSTABLE SADDLE — BRONZE BUSHED BEARING

Matchless for long wear and convenience. Simply rotate to a new bearing surface and obtain several times ordinary life. Walking beam may be adjusted laterally and to and from the well for exact centering.

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Foundry & Machine Works, Inc.
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Hydraulic and Pneumatic Controls. Manual 4G contains important general information such as a detailed description and illustration of the Shear-Seal principle and its application in manual and solenoid valves. Pressure switch selection has been put into plain, understandable terms in a selection chart based on users' requirements. The data are helpful to engineers concerned with hydraulic or pneumatic control. *Barksdale Valves.*

Check No. 21 On The Time Saver Card

●

Gas Analysis By Electro-Conductivity Method. Electro-conductivity gas analyzers by Davis with instrumentation by Honeywell are described and illustrated in new Instrumentation Data Sheet 10.15-12. This two-page technical brochure presents theory, operation, and applications for these sensitive gas analyzers and recorders. *Industrial Division, Minneapolis-Honeywell Regulator Co.*

Check No. 22 On The Time Saver Card

●

Application of Aluminum Jacketing, a new folder, contains complete application instructions for Childers jacketing for weatherproofing of insulated lines, towers, vessels, and tanks. Completely illustrated with detailed drawings, the folder explains in simple and concise language how Childers jacketing is applied on insulated lines including ells, tees, and bends. Also shown and explained is the application of Childers aluminum jacketing on towers, vessels, and tanks. *Childers Manufacturing Co.*

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●

How A Wire Mesh Demister Stopped Caustic Spray In Scrubber. An interesting case story, presented by reproducing the initial correspondence, recommendations, order, and service history, explains in detail how the installation of a monel wire mesh demister pad put an end to a serious air pollution problem caused by fine caustic spray from a scrubbing tower. *Otto H. York, Inc.*

Check No. 24 On The Time Saver Card

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Schield Bantam Specification Bulletin No. TSH-301 contains shovel specifications, capacities, and other information about optional shovel equipment such as electric dipper trip and rehandling buckets, and job action photos showing typical Bantam shovel applications for the Model T-35 ⅜-yd., 6-ton, truck-mounted Bantam. *Schield Bantam Co.*

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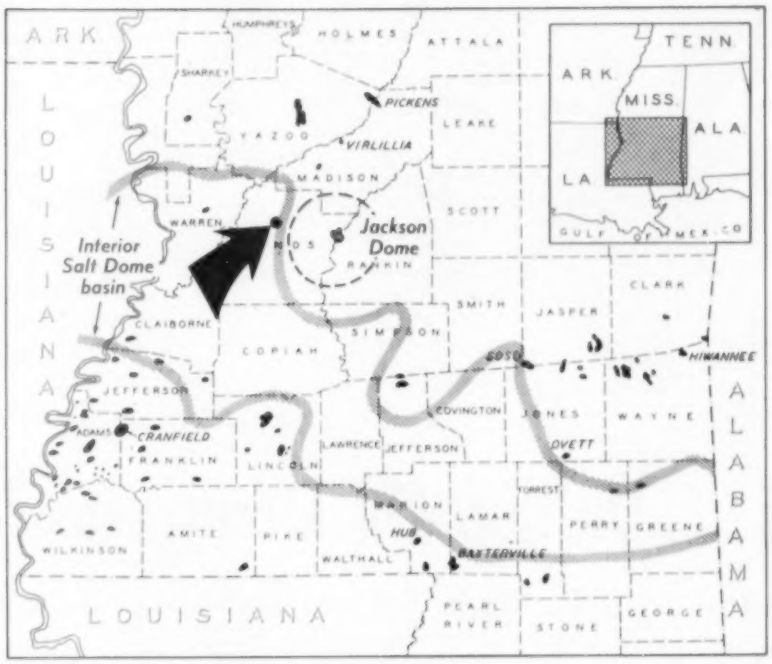


Bolton field (arrow) is considered Mississippi's best discovery in recent years. Named fields produce from Lower Cretaceous pays. Others produce from younger formations.

Mississippi Gets Its Discovery; Bounds Back Into the News

by Frank J. Gardner

MISSISSIPPI needs a good oil discovery. Not just an ordinary one, but a remarkable one. For the past few years, there hadn't been much to stimulate the imagination and kindle the fervor of discovery thinking among the oil hunters down that way.

And last week, it came. As 748 bbl. of oil per day poured out of the Paluxy sand section at 9,920 ft., Hinds County, Mississippi, made the headlines. Larco Drilling Co. 1 Lettie McAlpin et al had made a kind of geological history.

For this is just what the geologists in Mississippi had been waiting for. For a long time, they've known that eventually the deeply buried Lower Cretaceous section would pay off with flush oil production, but up until now their efforts had met with lukewarm results. Six fair-to-middling oil fields and a couple of gas pools had been the payoff in the Lower Cretaceous; of these, SoSo and Hiwannee had been the best, and over-all, results had been disappointing.

Five tests reveal prolific flow . . . The new discovery, now named Bolton field, lies 12 miles west and slightly north of Jackson, in Section 19-6n-2w (arrow on map). A series of five 1½-hour tests of the perforated interval 9,920-40 ft. reveals the impressive potentialities of the well.

Choke	Flow rate	Tubing pressure	Gas-Oil ratio	Gravity
16/64-in.	748 bbl.	790 psi.	308-1	38.3
12/64-in.	545 bbl.	900 psi.	266-1	37.9
10/64-in.	633 bbl.	1,000 psi.	72-1	34.9
8/64-in.	274 bbl.	1,050 psi.	191-1	35.4
6/64-in.	172 bbl.	1,100 psi.	159-1	37.0

Recent Mississippi state regulations will allow a flow of 300 bbl. daily from the well.

Lease play widespread . . . Immediately following the news of the strike, a vigorous leasing spree enveloped the waist of Mississippi across Hinds, Rankin, Simpson, Smith, and Copiah counties. Old prospects are being re-examined and lease and royalty prices are soaring. Three-year leases around the drilling block are going for $250 per acre bonus, with $25 per year delay rental and no overriding royalty; royalty prices have reached $1,200 to $1,500 per acre, and leases away from the block in surrounding counties command $10 per acre.

It's quite a play, and it packs a lot of significance for the future of Mississippi oil. For it is here, in the cross-state trend from the common corner of Louisiana, Arkansas, and Mississippi eastward to the vicinity of Hiwannee field, that geologists believe the Lower Cretaceous subsurface wedgeout occurs as a giant stratigraphic trap. To the minds of many authorities, it represents one of the country's largest untested areas of regional updip wedging in known reservoir rocks and is a potential trap area involving thousands of square miles. The subsurface wedgeout beneath the unconformity between Upper and Lower Cretaceous formations presents structural conditions approaching textbook perfection. But finding the localized deformations and stratigraphic variations necessary to the concentration of oil pools is a difficult subsurface problem, and Mississippi geologists for years have wished for a 25,000-ft. seeing eye.

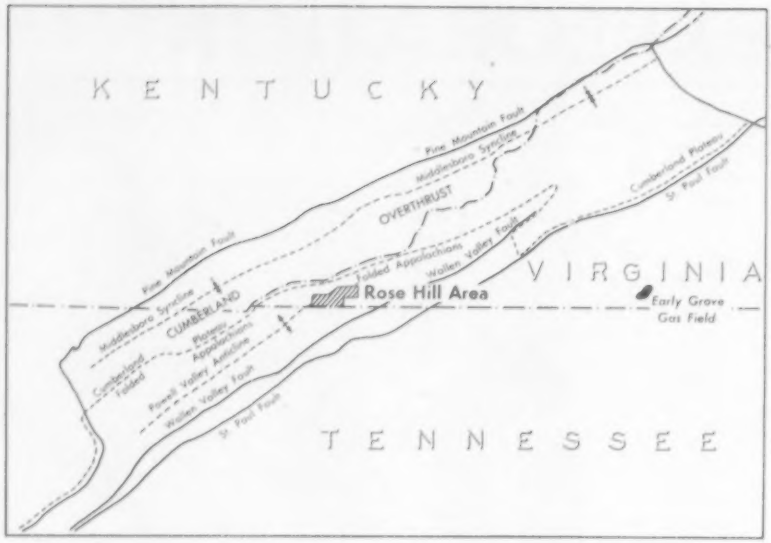
It is a problem calling for classical geology; data, bit by bit, are accumulating, and eventually the secret of occurrence will be laid bare.

Structural implications . . . Locally, the new field lies on the eastern limb of the Big Black River syncline, off the west flank of the Jackson dome. This dome is the largest local structure in Mississippi, with a diameter of 25 to 30 miles and closure of 2,500 ft. on the top of the Cretaceous. It was uplifted during late Upper Cretaceous (Taylor) time and was either accompanied or caused by igneous intrusion. Gravity effects indicate a broad domal uplift of basement rocks beneath the structure.

Whether the newly discovered field possesses a direct structural relation to the Jackson domal uplift is not yet known, but wells to the west of it already have revealed abnormal upward inclination to the east. As more wells are drilled in the vicinity, a first-class structuro-stratigraphic trap may be revealed on the western flank of the oldest known surface structure in Mississippi.

It is a remarkable new oil discovery.

Rose Hill field is located in the extreme southwestern corner of Virginia. At right is map showing major structural features of Cumberland Overthrust block. Rose Hill area is indicated in shaded area.



Rose Hill Field . . . Unique Oil Occurrence?

Still first and only field in Appalachians' folded and faulted belt

by Ralph L. Miller

ROSE HILL oil field in Lee County, Southwest Virginia, is significant for two reasons. It was the first and still is the only oil field in the folded and faulted belt of the Appalachian chain of mountains and valleys, despite the fact that 12 years have elapsed since its discovery in 1942.

Rose Hill field demonstrates unequivocally that oil can accumulate in commercial quantities in this highly deformed part of the Appalachians, and it may presage exploration for additional oil fields in this long though rather narrow province. It is also significant because the local structure in and near Rose Hill oil field is complex. Despite this complexity the data from surface geologic studies and from drilling are sufficiently abundant that almost all the major structural features and many of the minor ones can be and have been deciphered. These features are demonstrable in the field and on maps and sections.

Production record . . . Rose Hill oil field is not significant for its past production record, which totaled 222,000 bbl. to the end of 1953, or for its promise of greater production in the future than in the past. Nor does it clearly point the way to areas where other oil fields can be sought with reasonable expectation of success. Other prospective drilling areas where the stratigraphic and structural situation appears quite similar to the situation at Rose Hill do exist, however, in Lee County. Most of these have not been tested at all. A few have been unsuccessfully but rather inadequately tested. Still other areas to the northeast of Lee County and a few areas to the southwest along the belt of folded and faulted Appalachians may invite consideration and study as possible petroliferous regions. These areas have not been drilled, and most of them are not yet adequately mapped geologically.

Author is geologist, U.S.G.S., Washington, D. C. Publication authorized by the director, U.S.G.S.

Geologic Succession in Rose Hill Field

Age and formation—	Thickness (ft.)
DEVONIAN:	
Brallier shale	150+
SILURIAN:	
Beds of Cayuga age	120
Clinton formation:	
Upper shale member	245
Ore member	295
Sandstone member	110
Lower shale member (iron bed)	90
UPPER ORDOVICIAN:	
Sequatchie formation	265
Martinsburg shale	360
MIDDLE ORDOVICIAN:	
Trenton limestone	560
Eggleston limestone	145
Lowville limestone	870
LOWER ORDOVICIAN:	
Lenoir limestone	130
Mosheim limestone	60
Murfreesboro limestone	270
Beekmantown dolomite	1,305
UPPER CAMBRIAN:	
Copper Ridge dolomite	840
Maynardville limestone	260
Nalichucky shale	200+

Pay zone . . . Almost all the known oil in Rose Hill field is contained in the Trenton limestone of Middle Ordovician age. The Trenton appears to have neither primary nor secondary porosity sufficient to account for the oil that has been produced. Rather, the oil is believed to be contained in fractures and crevices and along bedding planes, which in places have probably been somewhat enlarged by solution.

Rose Hill Structure

Overlying the Trenton in the producing area are some 1,000 ft. of younger Ordovician and Silurian rocks. Above

this, however, lies a major fault, the Pine Mountain overthrust, along which Cambrian rocks have moved northwestward nearly 6 miles over the Silurian rocks. The slice of rocks that is involved in the Pine Mountain overthrusting is 125 miles long from northeast to southwest and about 25 miles wide. It includes formations of all ages from Cambrian to Pennsylvanian. In parts of the block all these formations are exposed or are known from drilling. In the vicinity of Rose Hill oil field, however, the entire thickness of the overriding block has in places been removed by erosion, thus exposing the uppermost formations of the underlying stationary block in a series of fensters. Almost all the known oil in the oil field has been found by wells drilled in one or another of these fensters. This is not entirely fortuitous inasmuch as the oil-bearing Trenton is structurally high beneath the fensters and is also either nearly flat lying or very slightly arched beneath the fensters.

The subsurface position and attitude of the Trenton in the surrounding region where the stationary block is concealed beneath uneroded overriding rocks has been partly proved by drilling, and elsewhere has been interpreted with some assurance from indirect geologic evidence. Oil may also be present in these concealed parts of the stationary blocks, particularly to the northeast of Rose Hill field, but little drilling has so far been done to prove or disprove this supposition. Still other fensters exist northeast of the Rose Hill area in the so-called Jonesville district. These have not been drilled.

Regional Folding and Faulting

This brief description of the structure in the Rose Hill area does not take account of the numerous minor complications involved in the folding and faulting of the region. Many rock slices of all sizes from a few feet to several miles in longest dimensions have broken loose from the overriding and overridden blocks and have been left along the major plane of overthrusting in anomalous relation to the rocks above and below. Where these slices have been exposed by erosion the resulting pattern of the geologic maps in these areas becomes intricate, and the simpler outline of the major geologic events is obscured.

The late stages of overthrusting were accompanied by and followed by folding that produced anticlines and synclines on a regional scale, the largest and most significant of which are: (1) the Middleboro syncline on the northwest side of the Cumberland block, in which coal-bearing strata of Pennsylvanian age are preserved, and (2) the Powell Valley anticline on the southeast, along the axis of what most of the overthrust rocks have been removed by erosion, and locally all of them have been removed to account for the previously described fensters.

Source rock of oil . . . The source rock of the oil that has accumulated in the Trenton is believed to be the organic-rich limestone of the Trenton itself. Almost everywhere in this region outcropping sequences of the Trenton contain numerous dark-colored fossiliferous limestone beds, and many of these limestone beds have a distinct petroliferous odor. Other formations that might be potential source rocks for the oil are sealed off from the Trenton by seemingly impervious formations or are in structural relations to the Trenton such as would seem to preclude migration of oil from them into the Trenton. Thus the oil in the oil field has probably migrated only a short distance to its present location and has accumulated in structurally favorable locations where fracturing of the limestone is sufficiently great to provide space for the oil to be retained.

Unique Oil Occurrence?

Among the most interesting speculations involving the Rose Hill field is whether this unusual oil occurrence is unique, or whether other fields can be found in the folded and faulted rocks of the Appalachian belt that will perhaps be more productive and thus economically more inviting. Additional geological mapping and stratigraphic studies are needed to outline the more promising regions, and these studies can perhaps be supplemented to advantage by some geolphysical work. Eventually the more promising prospects that can be recognized by these studies will need to be drilled before we can determine whether the folded Appalachian physiographic province is also an oil province, or whether Rose Hill oil field is indeed unique.

KENTUCKY

EASTERN KENTUCKY

ASHLAND.—In the newly discovered pool on the Wolfe-Morgan County line first offset confirmation test has resulted in a dry hole. Crate Rice, et al have a failure at 2 Bruce Rose in 19-P-74 as Corniferous and Big Six formations had only slight show of oil of non-commercial importance. Corniferous lime was topped at 1,505 ft. and Big Six at 1,668 ft. Total depth of test is 1,715 ft.

In Johnson County and on west edge of Martha Pool, Mullins and West have completed three new wells on the Ira Lester farm. Wells numbers 12, 13, and 14 each made approximately 10 bbls. of oil daily from the Mississippian Weir sand at an average depth of 995 ft. All wells were shot with 100 qts. of nitroglycerin.

HUGOTON EMBAYMENT

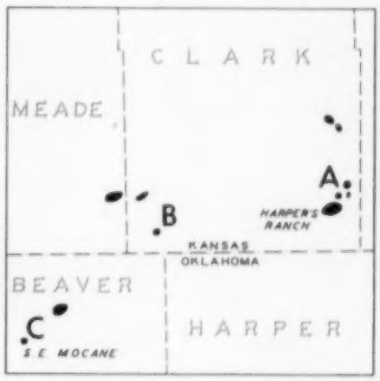
Morrow Discovery In Hansford Awaiting Its Potential

Potential is being awaited at United Producing Co. 4 Lola Jackson, 5 miles south of Hitchland and 3 miles southwest of Hitchland field Douglas sand production in Hansford County, Texas Panhandle.

Following fracture the final company gage at the strike was 60,000 M.c.f. of gas per day from perforations at 6,586-6,606 ft.

Humble Oil & Refining Co. is taking potential on the other side of the Hitchland area at 1 Collier "C", ½-mile southwest outpost to the 1 Frazier, recently completed as a 2¼-mile northeast field extensioner. The Collier "C" gaged 85 bbl. of oil in 8 hours through 24/64-in. choke from perforations in the Pennsylvanian Douglas sand at 4,529-37 ft. The perforations had been acidized.

East Gruver outpost . . . Humble is putting up pumping equipment at 1 Wilbanks, southeast outpost to East Gruver field, Hansford County. This is the first oil well in the area. Production is from the Strawn at 5,975-88 ft.



One of the best oil fields in southwestern Kansas is developing at the northeast flank extension area of Harper's Ranch field (A on map). Delhi Oil Corp. 1 Gross (B on map) recently completed as a 2¼-mile northeast extension discovery to McKinney field Mississippian gas production. The well flowed 7,350 M.c.f. of gas per day from the Chester. The area (at C on map) has been named Southeast Mocane by the Oklahoma Nomenclature Committee. It is The Texas Co. 1 Barby "A."

Stanton Morrow Discovery Awaiting Potential

J. M. Huber Corp. 1 Sparks, C NE 34-30s-42w, 8 miles south of Manter, Kansas, is shut-in after final flow gage of 16,500 M.c.f. of gas per day was reported from Morrow sand perforations at 5,254-74 ft.

The important strike is 10 miles west of Permian Hugoton field production.

Harper's Ranch Extension One Of Southwest Kansas' Best

One of the best oil fields in southwestern Kansas is developing rapidly as the result of excellent success in the Harper's Ranch area of Clark County.

Pure Oil Co. 1 Harper, which had a potential of 846 bbl. of oil per day on bomb

test, is the most recent completion in the northeast flank extension area. Production is from Morrow sand at 5,435-55 ft.

Mid-Continent Petroleum Corp. is completing another good well at 1 Gibson, ½ mile north of nearest production in SW SW 35-33s-21w. A test of the Morrow flowed oil at the estimated rate of 10-12 bbl. per hour. Recovery was 480 ft. of free oil.

Testing is still under way at United Producing Co. 6 Harper, NW NE 3-34s-21w. This well flowed 254 bbl. of oil per day. The 5 Harper is also waiting for potential. This west side well produced 59 bbl. of oil per day on preliminary tests.

TEXAS

NORTH TEXAS

Strawn Discovery Finaled In Western Jack County

A new Strawn discovery has been completed by Walter L. Plemons Production Co. at 2 Hickman, 10 miles southwest of Jacksboro and ½ mile southeast of Steed field.

The discovery flowed 360 bbl. of 40°-gravity oil on a 24-hour test from Strawn perforations at 2,876-86 ft. The new field will be called Hickman Strawn.

Grayson Has Flush Strawn Discovery

L. O. McMillan 1 Foster, 5½ miles north of Whitesboro and 1½ miles southwest of Sandusky field in Grayson County, has basal Strawn flush production virtually assured.

Recovery on a drill-stem test at 6,393-435 ft. was 5,400 ft. of 38.7°-gravity oil. Initial flowing pressure was 1,330 psi.

TEXAS GULF COAST

New Gas-Condensate Area Found in Brazoria County

A new gas-condensate producing area, located 2½ miles south of Alvin, in Brazoria County, apparently has been uncovered by Dillard & Waltermire, Inc., and A. C. Glassell, Jr.

The indicated discovery well, 1 Oliver, in H&TB Survey 10, was shut in after preliminary ungaged tests but flow of gas and condensate was fairly conclusive of commercial production. Shut-in pressure was 4,000 psi.

Location is about midway between Alvin field, at Alvin, to the north and the large, multiple-pay Chocolate Bayou field, to the south. It is about ¾ mile south of an abandoned gas-condensate well completed in 1951 by G. S. Hammonds with production from a deeper Frio sand at 11,184-90 ft.

Live Oak County Discovery Confirmed by Second Well

Lloyd Parker and Cosden Petroleum Corp. recorded a flow of 84.3 bbl. of 40.2°-gravity oil on a 24-hour production gage through ¼-in. choke at their new discovery well, 1 Maggie McNeill estate, in the Jane Curry Sur., 3½ miles southwest of Dinero, in Live Oak County.

In the meantime, their second test, 1-A McNeill estate, 700 ft. west of the first, has reached the 4,450-ft. Hockley pay zone, and has run casing for production tests. Substantial oil recoveries obtained in two drill-stem tests, one at 4,445-55 ft. and the other at 4,456-64 ft. virtually have assured commercial production and confirmation of the first well's discovery. Pay interval of the latter well is 4,437-45 ft.

The new area is about midway between Whittington and McNeill fields.

New Oil Area Opened in Discovery Near Tomball

New Cockfield oil production has been opened about a mile southwest of Tomball field, in northern Harris County, where H. E. Williams completed his 1 Adams with a potential flow of 119.77 bbl. of 40°-gravity crude per day, gaged through 7/64-in. choke with 750-psi. pressure and gas-oil ratio of 1,630 cu. ft. per barrel. Perforated pay-interval is 5,573-74 ft.

Spot location is in the M. Tejerino Survey, about 4 miles southwest of Tomball townsite.

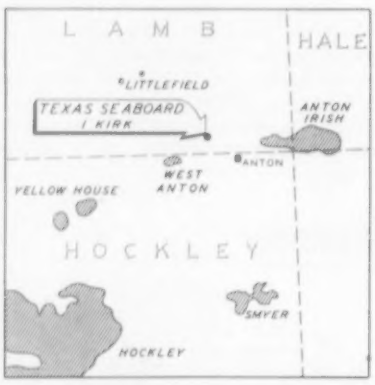
Victoria Gas Discovery

Magnolia Petroleum Co. has a new dry-gas discovery-well about 1¾ miles southeast of Keeran Ranch field, in southeastern Victoria County, where its 2-A Keeran Ranch flowed at the rate of 1,469,000 cu. ft. per day with pressure of 926 psi. on tests through ¼-in. choke. Absolute open-flow gage was at the rate of 4,500,000 cu. ft. per day. Gas is from a relatively shallow sand, perforated at 3,356-61 ft. and 3,363-64 ft. Lower zones tested salt water. Hole was drilled to 8,600 ft. Location is in the Martin de Leon Survey.

WEST TEXAS

Oil Show Reported At Lamb County Well

The Texas Co.-Seaboard Oil Co. 1 Kirk, 4 miles northwest of Anton in Lamb County, northern West Texas, swabbed 140 bbl. of fluid in 10 hours, shakeout 4 to 10 per cent water.



The wildcat plugged back to 6,492 ft. and acidized with 1,000 gal. through perforations at 6,482-91 ft. The well is continuing to swab with 2,500 ft. of fluid in the hole. Location is in NW NW Section 6, Block 1, R. M. Thompson Survey.

Delaware Sand Pay Opened in Ward Area

Humble Oil & Refining Co. 1 State University "AC" has opened Delaware sand pay 4 miles southwest of Magnolia 1-B U-Tex, another Delaware sand oil discovery.

The strike is pumping 107 bbl. of oil on official potential test.

Pennsylvanian Opened in Parker Wolfcamp Field

Fred Turner, Jr. et al 2 Parker, 3 miles southwest of Andrews, has been completed flowing 1,150 bbl. of oil per day, calculated flow.

The discovery opens Pennsylvanian pay in Parker Wolfcamp field. The discovery flowed 287 bbl. of oil through ¾-in. choke on 6-hour potential test. Gas-oil ratio is 963:1, gravity 41.6°. Top of the Penn lime was 8,937 ft., top of pay 9,087 ft.

Second Ellenburger Well Finaled in War-San Area

Midland County's War-San area has its second Ellenburger oil well at Warren Petroleum Corp. 2 TXL "G". The southwestern county well was finaled flowing 849 bbl. of oil through 48/64-in. choke. Gas-oil ratio was 783:1, gravity 52.6°. Production is from open hole section at 13,380-400 ft.

The well is the northwest offset to the 1 TXL "G". It is located in Section 39, Block 41, 3s, T&P, 13 miles south of Warfield.

SOUTHWEST TEXAS

Lower Coastal Area Gets Three New Deep Wildcats

Locations for three more deep wildcat tests to be drilled in the lower coastal area of Southwest Texas were reported the past week.

Deepest of the projected tests will be by Holmes Drilling Co. at 1 Sweeney, located 2½ miles north of Los Fresnos, in Cameron County. It is scheduled to go to 11,500 ft. Location is in Espiritu Santo Grant. It is about 10 miles south of Willamar field.

Shell Oil Co. will drill a 9,000-ft. test at 1 Campbell, in San Juan de Carricitos Grant, 17 miles southeast of Raymondville, in southeastern Willacy County.

The third new deep test, located in southern Hidalgo County, will be by Houston Oil Co. and American Republics Corp. at 1 Hidalgo-Willacy County Oil Co., in the Los Ejidos Grant, about 2 miles south of Tabasco field. It is scheduled for 10,500 ft.

WEST CENTRAL TEXAS

Best Producer in More Than Year in Callahan

Callahan County has one of the best producers in more than a year at Fain and McGaha 1 Snyder et al, 8 miles northeast of Baird in an old shallow producing area.

The deep pay discovery flowed 240 bbl. of oil in 3 hours for a calculated daily gage of 1,920 bbl. of oil through open hole at 4,357-67 ft. in the Barnett shale. The flow was through ¾-in. choke. Gas-oil ratio was 600:1, gravity 41°. It is located in Section 6, Block C, T&NO Railway Survey.

Taylor County . . . A Tannehill flowing oil discovery has been completed by Gogle Bros. Drilling Co. at 1 Price, 2½ miles southwest of Merkel.

The well was completed for 366 bbl. of 39.9°-gravity oil per day from perforations at 2,734-42 ft. Production was through 24/64-in. choke. The discovery is the west offset

to White 1 Bland, discovery well of White Saddle Creek field. The 1 Price is located in Section 51, Block 19, T&P Survey.

Coleman County . . . New Morris sand oil production was opened 2 miles northeast of Silver Valley at E. C. Brown et al 1 Croom, Section 36, Block 2, GH&H Survey.

The well was completed for 85 bbl. of oil through perforations in the Morris sand at 2,846-50 ft. The new field is called Croom Morris.

NEW MEXICO

SOUTHEASTERN NEW MEXICO

Pennsylvanian Oil Flows At Lea County Prospect

The north offset to Warren Petroleum Corp. 1 Mills-Federal, Bough lime discovery in northern Lea County, has flowed oil from the same zone in the Pennsylvanian on a drill-stem test at 9,674-97 ft.

Atlantic Refining Co.'s 1 State "AD", flowed at the estimated rate of 100 bbl. of oil per hour. It reversed out and recovered 114 ft. of free oil.

The 1 State "AD" is the fourth producer for the new Pennsylvanian lime field. Warren has a west offset to the field discovery. Magnolia Petroleum Co. has a pumping well at 1 Childers-Federal . . an east offset to the discovery well.

APPALACHIAN AREA

OHIO

Deep Rock Oil Corp.'s second test in Washington Township, Hocking County, ¼ mile east of the first, proved successful. On 1 W. D. Mosure, Section 12, the Clinton was logged at 2,912-2,931 ft. with a show of gas and 1 bbl. an hour natural. In a 24-hour test after fracturing, the test produced 209 bbl. and 500,000 cu. ft. of gas.

Two wildcats have been started in eastern Stark County, Paris Township, by Natural Gas W. Va., one being on 1 Willis Roudebush, Section 26, and the other on 1 L. Czekonski, Section 32. In Marlbora Township, Belden Oil & Gas Co. is drilling near an old wildcat test that had a good showing of oil but was never produced.

PENNSYLVANIA

Derry Township, Westmoreland County, Southwest Pennsylvania, Mid East Oil & Gas Co. 1 Frank Litvik, reached the Oriskany sand at 7,893 ft., the Helderberg at 7,915 ft., and is drilling at 7,923 ft. Monroe Township, Bedford County, John Galey 1 Donald H. Miller, is drilling at 4,612 ft. Parker Township, Butler County, Walker et al. 1 Walker, is at 2,005 ft., Connellsville Township, Fayette County, Peoples Natural Gas Co., 4030 F. K. Buttermore Heirs, shut down at 6,270 ft., and is moving in a rotary outfit. Salt Lick Township, Mid Atlantic Oil & Gas Co. 1 Adolph Dupre, is drilling at 3,460 ft.

WEST VIRGINIA

Hamilton district, Nicholas County, West Virginia, Hope Natural Gas Co., 9725 Scott Morris, deep wildcat, elevation 1,923 ft., resulted in a dry hole. Two treatments in the chert were not commercially successful. Onondaga 6,777 ft., chert 6,793-6,928 ft., show gas 6,901-6,905 ft., Oriskany sand 6,928-6,984 ft., TD 7,208 ft. The hole was plugged back to 1,736 ft., and may be produced from this depth.

Middle Fork district, Randolph County, Bobray Exploration Co. 2 Chester C. Housh, elevation 2,053 ft., gaged 600,000 cu. ft., gas, Fifth sand 1,436 ft., gas 1,436-1,445 ft., TD 1,515 ft. In Triadelphia district, Logan County, an exceptionally good gas well in the Big lime formation was 2 Arthur Chafin, completed by Arthur Chapin et al., gaging 22,000,000 cu. ft. of gas blowing the tools out of the hole, TD 2,833 ft. Considerable interest will be shown in the acreage in which this well is located, a large amount of which is not under lease.

ILLINOIS

Midway between Lawrenceville and Robinson in Crawford County, Illinois has one of its biggest new areas in the last 5 years. Affeld Oil Co. has Pennsylvanian and Cypress production, making over 5,000 bbl. of oil per day. Ervin Drilling Co., Steckler & Rea have new Benoist discoveries also in the area.

In Edwards County New Illinois Mid-Continent Oil Co. 1 Harris-Woods, 18-2s-10e, 5 miles southwest of Albion, is testing the McClosky lime. Recovery on a 2-hour test of the Benoist at 3,192-3,204 ft. was 1,390 ft. of clean oil. Bottom-hole pressure was 1,285 psi. A 10-ft. section of saturated Aux Vases sand was cored at 3,232-42 ft.

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LOUISIANA

SOUTH LOUISIANA

Outpost Test Produces in New Sullivan's Lake Area

Productive area of Union Producing Co.'s year-old Sullivan's Lake field, in Iberville Parish, is being extended more than 2,900 ft. to the southwest with another gas-condensate well. Completion of the latter well, 1-A Tempieton, gives the field five wells, four productive of gas and condensate, and one oil. Pay interval, perforated, is 11,010-18 ft.

The field was opened in June 1953. The first three wells were gas-condensate producers in the 11,000-ft. sand. The lone oil producer, a north outpost well, was completed last May in a deeper sand, perforated at 12,343-45 ft.

New Deep Sand Opened in Queen Bess Island Field

Another ultra-deep sand has been found productive of gas and condensate in Queen Bess Island field, located in the coastal marshes bordering Barataria Bay, in southern Jefferson Parish.

The reservoir opened by The Texas Co. at its 12 State-Barataria Bay, is perforated at 15,454-81 ft. Flow through 12/64-in. choke was at the daily rate of 9,130,000 cu. ft. of gas and 123 bbl. of 44°-gravity condensate. Flowing pressure gaged 5,150 psi. No formation water was indicated.

Another new sand, more than 200 ft. deeper with perforations at 15,684-15,700 ft., previously was tested. Some 31.5°-gravity oil was recovered by swabbing, but the well would not flow.

The well had been drilled to 16,045 ft. Its production extends the field ¾ mile to the north.

Shallow Sand Produces In Bay Marchand Field

A new, relatively shallow oil sand, overlying the salt mass, at Bay Marchand Block 2 field, on the coast of LaFourche Parish, has been opened by California Co. at its 4-I State Lease 1367.

The sand, which tested a flow of 195 bbl. of 25.3°-gravity oil per day through 19/64-in. choke, is perforated at 4,060-69 ft. Bottom of the hole at 4,127 ft. is in salt, topped around 4,113 ft.

Crescent Farms Field Spreads to Northwest

The new Crescent Farms gas-condensate field, 5 miles west of Houma, in northern Terrebonne Parish, has been extended approximately 1,900 ft. to the northwest by the area's third well, Arkansas Fuel Oil Corp.'s wholly owned 1 Southdown Sugars Unit.

The newly completed well, producing from a perforated interval at 11,334-46 ft., in a 65-ft. pay section in the Realty (Miocene) sand, flowed at the rate of 6,348,000 cu. ft. of gas per day through ¼-in. choke, against pressure of 4,618 psi. on the tubing. Condensate yield was estimated at 18 bbl. per million cubic feet of gas.

The two previously completed wells were drilled with John Mecom as joint operator. The discovery well, 2 Southdown Sugars, was completed last February with pay interval at 11,316-26 ft. The discovery was confirmed in May with these operators' 1 Southern Sugars Unit 2, located 2,600 ft. southeast of the initial well. Perforated interval is 11,285-11,312 ft.

NORTH LOUISIANA

Two Wilcox Strikes Seen For Concordia Parish

Two new Wilcox oil fields are indicated in east-central Louisiana's Concordia Parish.

W. L. Billups, Gauthier & Heards 1 Miller et al, 40-8n-10e, 5½ miles northeast of Ferriday, flowed 130 bbl. of 41°-gravity oil per day through ⅝-in. tubing choke. Testing continues through perforations at 5,147-49 ft. in what is called the Artman member of the Wilcox series. The strike is 1½ miles southwest of Lake St. John.

To the north of the 1 Miller et al 3 miles Durbin Bond & Co. and Petersen Drilling Co. 1 Turner, 20-8n-10e, Milestone Forks on Rifle Point, also is an indicated Wilcox discovery.

Waverly Point . . . E. C. Wentworth and Como Drilling Co. have completed 2 Murray, 11-7n-10e, opening Waverly Point Wilcox field in Concordia Parish. Production is from perforations at 5,564-69 ft. The well flowed 106 bbl. of oil daily through 12/64-in. tubing choke. This strike is 1½ miles northwest of Vidalia.

This announcement is neither an offer to sell nor a solicitation of an offer to buy any of these securities. The offering is made only by the Prospectus.

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OKLAHOMA

Holdenville Production Is Being Connected

Rapid field development in the Holdenville area of Hughes County is linking up parts of the hot Booch sand play.

Globe Oil & Refining Co. 1 State "D", NW NW SW 5-7n-9e, was completed on flow of 1.66 bbl. of oil per hour through 12/64-in. choke from perforations at 2,834-44 ft. Powel Briscoe has finaled two wells at the north end of the field. The 2 Pogue, SE NW NW 5, flowed 30 bbl. of oil per hour from perforations in the Booch sand at 2,830-38 ft. through 20/64-in. choke. The 3 Pogue in the SW NE NW 5 flowed 32 bbl. of oil from perforations at 2,838-55 ft. through 19/64-in. choke.

Kay Discovery Reports High Gas Flow On Test

A lower Skinner gas discovery in Kay County made a high gas flow on test. C. L. Carlock 1 Boxley, NE NE NE 36-27n-4e, has an estimated capacity of 25,000 M.c.f. of gas per day. A test taken by Cities Service flowed 20,000 M.c.f. of gas per day with all pressure the instrument would allow. Rock pressure was 1,036 psi.

Production is from perforations at 2,992½-3,000 ft.

New Pools Named in Oklahoma Areas

The Oklahoma Nomenclature Committee of the Mid-Continent Oil and Gas Associa-

tion has given names to new pools in various areas of Oklahoma.

Panhandle . . . The Texas Co. 1 Barby "A", C NW NW 2-4n-25eCM, Beaver County, opens Southeast Mocane gas field. In southeastern Texas County United Producing Co. 1 Sillars, C NW SE 36-2n-19eCM, opens Grand Valley gas field.

Big Southeast Camrick oil and gas field in Texas County has been redescribed and designated as the Camrick gas area. The field has one oil well.

South-central . . . Goldsmith & Perkins 1 Coller, C SW NE 24-4n-4w, Garvin County, opens East Erin Springs oil field. John Stapleton 1 Bumpers, C NW NW 34-4n-5e, Pontotoc County, opens West Jones Chapel field. In Seminole County Hall, Troup & Moore 1 Bowles, SE NW SW 10-6n-6e, opens South Dora oil field.

Southwest . . . In Greer County Boles and B. H. & C. Drilling Co. 1 Sells, NE SE SE 5-7n-21w, opens Southwest Retrop oil field.

Central . . . Davidor & Davidor 1 Wakley, NE NE SE 21-15n-3e, opens North Sweet Home oil field in Lincoln County. Also in Lincoln County Lee Evans Drilling Co., Inc. 1 Sudheimer, SE NW SW 24-15n-3e, opens South Mt. Vernon oil field. Woodward & Co. 1 Trawick, NE NE NE 26-16n-5e, Lincoln County, opens Baker oil field.

Oklahoma County's new oil field in SE SW SW 9-14n-3w, is North Higbee, opened by Harper-Turner Drilling Co. 1 Della.

North . . . Russell Cobb 1 State, SE NE NE 36-27n-2w, opens North Hubbard oil field in Kay County. In Osage County, Sunray Oil Corp. 1 Osage, SW SW SW 7-26n-10e, opens South Whitetail field.

Payne County's new pool is East Schlegal, SW SE NE 27-18n-6e, opened by Neil A. Jackson et al 1 Cook.

Two Southeast Bradley Wells Testing in Grady

Grady's Bradley areas are in the development spotlight this week. Southeast Bradley field is enjoying a rapid development program with two new good wells taking production tests.

Magnolia Petroleum Co. 1 Burkes, C SW SW 12-4n-5w, swabbed load and flowed 49 bbl. of new oil in 4 hours from perforations at 9,376-9,434 ft. Flow was through 24/64-in. choke. The well flowed load and flowed 355 bbl. of new oil in 14 hours on 24/64-in. choke after fracturing.

In SE NE 11-4n-5w, the 2 Baughman flowed 191 bbl. of new oi lin 14 hours on 14/64-in. choke. Gas-oil ratio was 757:1.

Bradley pool . . . Rapid expansion of Bradley pool is also reported. Phillips Petroleum Co. is stepping out ½ mile to ¾ mile in this area. The pool is nearing connection with Southeast Bradley.

Phillips 1 Steve, Oklahoma's deepest oil producer, C SE NE 35-5n-5w, has plug set at 13,260 ft. in readiness for perforating and testing the third Bromide sand. McLish and deep Oil Creek sands have already been proved as pay zones.

In SW SW 36 Phillips 1 Theodosia is below 9,750 ft. in sand and lime. Northeast of field production the 1 Sterr, C NE SW 25-5n-5w, is making hole below 4,530 ft. The 1 Maxine, C SW SE 26, is below 10,582 ft. Phillips also has a wildcat drilling at 1 Apatite, C SE SE 28-5n-5w. It is below 6,325 ft.

CANADA

Buck Lake Belly River Discovery Confirmed

Seaboard Oil Company has confirmed the discovery of light gravity crude oil in the Belly River sand formation at a wildcat in the Buck Lake area of west central Alberta, 14 miles south of the main development sector of Pembina oilfield and 68 miles southwest of Edmonton.

Oil production was indicated at the Seaboard-H. B. et al "B" 10-26 Buck Lake driller situated on LSD 10-26-45-7w5, during the second drill-stem test run in the Belly River sand horizon. The discovery formation was topped at 4,350 ft., or 1,146 ft. below sea level. First test in the sand, of interval 4,359 to 4,374 ft., with valve open 30 minutes gave up only 10 ft. of mud. Second test from 4,377 to 4,420 ft., flowed gas to surface 4 minutes after packer was opened. Maximum flow rate of 500,000 cu. ft. daily decreased throughout the 80-minute test and when packer was pulled a 4,200-ft. recovery of clean 36.2°-gravity crude oil and 100 ft. of mud was recorded. Third attempted test, from 4,428 to 4,471 ft., was a misrun. Last test in the Belly River zone, from 4,434 to 4,471 ft. gave a pipe recovery of 245 ft. of mud during the 20 minutes that tester was open. Packer leaked slowly on the last test but engineers at the well considered the test conclusive. Crew of the Trident Drilling Co., Ltd., rig resumed drilling operations after the fourth test and at last report was making hole below 4,504 ft., drilling towards its main objective—the Cardium sand.

Nearest previous test to the discovery, Bailey-B. A.-Great Plains-Seaboard 1 Buck Lake, situated ½ mile east, was abandoned

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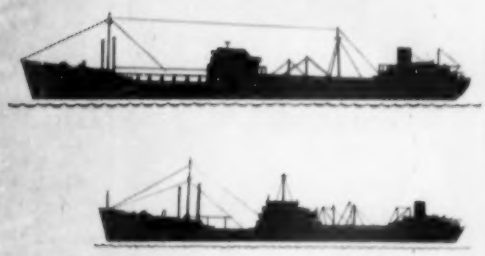

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after failing to find commercial oil or gas production after drilling into the Beaverhill Lake formation at a completion depth of 10,158 ft. Cardium sand oil production was indicated at the Seaboard-Great-Plains-Baysel-Los Nietos "B" 12-29 Buck Lake wildcat 3½ miles west of the new Belly River oil discovery, but evaluation tests on the well have not been completed.

Wayne area . . . Great Plains Development Company of Canada, Ltd., during this week announced discovery of gas in the Viking sand formation at an exploratory venture in the Wayne area of southern Alberta, 12 miles south of the town of Drumheller.

The well, Great Plains-Triad-Socony-C.P.R. "A" 11-11 Wayne, flowed natural gas at maximum rate of 3,690,000 cu. ft. daily during a 60-minute test.

Viking discovery drill-stem test was run of interval 3,885 to 3,908 ft. Gas flowed to surface in 3 minutes and the 350-ft. water cushion flowed to surface in 15 minutes. Recovery when drill-stem was pulled was 240 ft. of gassy mud and input water. The maximum gas flow rate of 3,690,000 cu. ft. daily leveled off at 3,400,000 cu. ft. daily by end of test. Crew is preparing to core ahead. Well-site is 1⅝ miles southwest of the Great Plains Socony 15-13 Wayne detritial formation 'wet gas' discovery and one mile west of the CPR 11-12 Wayne unsuccessful exploratory test.

Ontario . . . In Tilbury East township, Kent County, Robert McMaster and Co. has started a drilling test for Foster and Avery on the John Copeland farm, concession 9. The potential producing horizon is around 1,400 ft. depth, and if satisfactory indications are encountered in the first test, additional drilling will be undertaken.

In Wellington County a Guelph syndicate, drilling on the Tony Sinuk farm, 3 miles northwest of Acton, has encountered a small gas flow around 2,100 ft. depth. The well has been capped pending further investigation.

Petrolia . . . In the old Petrolia field in Lambton County Eastern Royalties, Inc., of Bradford, Pa., has started drilling on a tract of 265 acres in preparation for an attempt to bring back production by hydraulic pressure. Some 2 miles away, some of the oldest wells in the field are being sealed off to protect the oil horizons from water intrusion while the experiment is in progress.

MONTANA

Billings Field Trip Set for September

The Billings Geological Society will hold its annual field conference September 9, 10, and 11. Registration will be held in Billings, Montana, on Thursday, September 9, with Friday and Saturday being devoted to a field trip through the northern portion of the Big Horn basin and through adjacent areas. For additional information contact Reservations Chairman, Billings Geological Society, Box 844, Billings, Montana.

This is primarily a field conference with only two talks scheduled. Two full days will be devoted to studying sections, structures, and fields in the northern Big Horn basin area. Sections from the Lower Paleozoic through the Pryor conglomerate (Cretaceous) will be seen. Also such fields as Golden Dome, Dry Creek, Northwest Elk Basin, Elk Basin, and Frannie.

MICHIGAN

The prospect of Northville pool Trenton oil and pay being extended further north, into Oakland County, appeared encouraging this week as the Edward Torosian 1 H. Balko et al., NW SE SW 36-1n-7e, Lyon Township, Oakland County, showed both gas and oil from the Trenton on drill-stem test.

The 1 Balko, over a mile northwest of the Taggart 1 LeMaster discovery well, was tested for 4 hours in the Trenton at 4,426-4,746 ft. Gas showed to the surface in 45 minutes and blew steadily (no gage reported) for the balance of the test. Drill-pipe, at the conclusion of the test, carried 330 ft. of oil and gas-cut drilling fluid, strongly gas-cut, with good, clean oil breaking through. Trenton top was logged at 4,403 ft. Bottom-hole pressure built to 1,500 psi. in 1 hour. Flowing

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pressure dropped from 125 psi. to 30 psi. during the test.

Meanwhile, about ½ mile south of the Torosian 1 H. Balko, John Parris 1 Merritt, SE NW NW 1-1s-7e, Salem Township, Washtenaw County, drilled Trenton objective with cable tools from 4,367 ft., the top, to 4,769 ft., the present total depth, with no shows reported. Section was limestone. However, operator shot the Trenton earlier in the week with 380 quarts of nitro. Clean-out after shot was in progress. Operator plans to acidize with a large treatment in an attempt to break into the Trenton "golden lane" oil pay in Northville pool.

ROCKY MOUNTAIN

COLORADO

Morgan County Gas Discovery Completed

Petroleum, Inc., has completed a gas discovery 1½ miles northeast of Vallery field, Morgan County, for a flow of 4,932,000 cu. ft. per day. The well is 1 Schwindt, C SW NE 12-3n-59w. Production is from J sand at 5,920-36 ft.

Apparent Pool Opener in Washington Being Completed

Claycomb & Guida and New Drilling Co. are running casing at 1 Rodemeister, C SE SE 13-2n-54w, Washington County. The well is bottomed at 4,845 ft. Test showed a maximum flow of 4,500 M.c.f. of gas per day from the D sand interval 4,748-98 ft.

New Lyons Tests Located in Denver-Julesburg Basin

Drilling to pre-Cretaceous formations in the Denver-Julesburg basin has continued steadily since the discovery of oil in Lyons (Permian) sand in Keota field, Weld County, more than 1 year ago. Recent exploration below Cretaceous has not been at a rapid pace, however. Locations have recently been announced for widely separated deep prospects in the basin. Milton Pettersen has spudded 1 Lewis, C SW SW 23-14s-65w, El Paso County. It is scheduled to test Lyons at about 6,800 ft. On the northern edge of the basin Pure Oil Co. has made location for 1 Fee, SE SE SE 19-5n-69w. The Lyons objective is expected in this relatively shallower area of Larimer County at about 2,800 ft.

WYOMING

Park County Tensleep Discovery Near Completion

Mule Creek Oil Co. of Billings is running casing at the apparently substantial Tensleep discovery on the Big Polecat structure, Park County. The well, 1 Unit, E½ SE SW 16-57n-98w, is bottomed at 5,572 ft., and at this depth has penetrated more than 100 ft. of apparently effective Tensleep pay. Recoveries on drill-stem test below top of Tensleep at 5,368 ft. recovered oil varying in amount from 450 to 2,000 ft. in 1 hour. Water contact has not been reported.

Mule Creek has made a second location on the structure about 1 mile to the southeast of the discovery at 2 Unit, NE SW SW 22-57n-98w.

Maverick Springs Wildcat Abandoned

Cities Service Oil Co. has abandoned 3 Tribal, NE NE NW 36-6n-2w (WRM) in the Southeast Maverick Springs area of Fremont County. The operator reported a flow of 31 bbl. of oil and 221 bbl. of water in 18 hours from perforations 1,381-1,400 ft. Test was in Phosphoria. The well was drilled to a total depth of 1,663 ft. in Tensleep. Location is about 3 miles southeast of Phosphoria production in Maverick Springs field.

Sweetwater County Wildcat Announced

The Chicago Corp. and Republic Natural Gas Co. have made location for a Mesaverde test in the Alkeli Creek area, of Sweetwater County. The well is 1 Butterwick-Government, W½ SW NE 19-13n-99w. Objective depth is about 6,000 ft.

Tip Top Test Finds Frontier Gas Shows

General Petroleum Corp. recovered gas at the rate of 810,000 cu. ft. per day on test of the Frontier interval 5,367-5,435 ft. at 26-X-12 Tip Top, SE NW SW 12-28n-114w,

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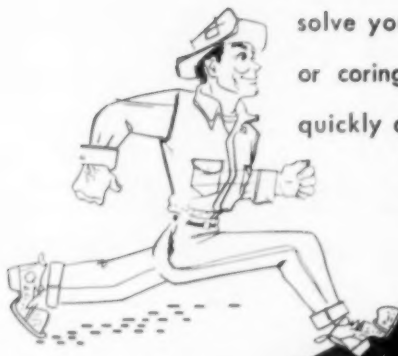

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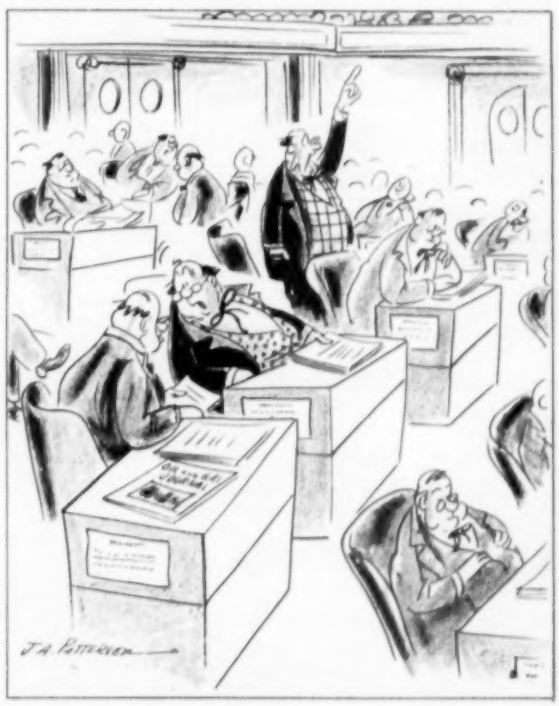


THE OIL AND GAS JOURNAL

"I don't understand his oil tax bill—too many big words in it."

Sublette County. Tool was open 1 hour and 20 minutes with gas at surface after 4 minutes. Recovery of pipe was 110 ft. of gas-cut mud. The operator is drilling below 5,675 ft. at the well.

Prospect Creek Wildcat Drilling

Husky Oil & Refining Co. of Cody has spudded 1 Cottonwood Land & Coal, SW NW NW 26-45n-98w, in the Prospect Creek area of Hot Springs County. The well is scheduled to test Tensleep at about 6,200 ft. The well is about 1½ miles north of a 4,500-ft. failure in Phosphoria drilled some time ago.

NORTH DAKOTA

Stark County Location Staked

Sun Oil Co. has made location for a wildcat 6 miles southeast of Fryburg field, in Stark County. The well is 1 Beaudoin, NW SW 9-138n-99w. It will test Mississippian at about 10,500 ft. Six miles southeast of the location a previous wildcat was abandoned at 10,225 ft. after logging gas shows in Madison.

Eighth Location in Benson County Series Announced

Shell Oil Co. has made location for 1 Myhre, SE NE 16-152n-68w, the eighth in a series of slim-hole tests in Benson County. The well is 8 miles to the northeast of the sixth well in the series, which was abandoned at 2,954 ft. Shell is now drilling at 1 Spidahl, SE NE 21-152n-69w. No shows have been reported in any of the wells drilled in this program to date.

MONTANA

Hill County Wildcat Abandoned

Amerada Petroleum Corp. has abandoned 1 Lenhard, C SW SW 13-36n-17e, in the Hogeland area of Hill County. The well had small shows in Sawtooth, but on test the formation yielded only water with a scum of oil. The operator is rigging up at a second wildcat 6 miles north of the failure.

Fallon County Prospector In Ordovician

The California Co. is coring at 10,000 ft. at 1 Unit, C SE NW 15-10n-56e, in the Pennell Unit, Fallon County. The well topped Silurian at 9,532 ft., but has reported no shows of significance. It is about 10 miles west of Cabin Creek where production is found both in Silurian and Ordovician.

Glacier County Discoveries Still Testing

Carter Oil Co. and Union Oil Co. of California are testing or preparing for tests at their two recent Glacier County apparent discoveries. The operators are reported swabbing the interval 5,715½-54 ft. at 1 Tribal-544, C NW NW 19-37n-8w, in the Landslide Butte area. No recovery has been reported since the statement that oil was recovered at the rate of 8½ bbl. per hour on swab test of the interval 5,772-94 ft.

At the second apparent discovery, 1 Miller-Tribal, C SW NE 7-33n-6w, in the Cadmus area. Carter and Union are moving out rotary preparatory to final testing. Casing is landed at 4,595 ft., and total depth is 4,782 ft. Both wells recovered oil test of lower Mississippian zones.

Stillwater County Exploratory Series Starting

Northern Natural Gas Producing Co. has made location for 1 NP, C NW SE 9-4n-20e, in the Big Coulee-Hailstone Dome area of Stillwater County. The well is the first in a series of three to be drilled by this operator under lease agreement with Northern Pacific Railroad. It will test Morrison at about 2,600 ft.

CALIFORNIA

CALIFORNIA

New Gas Pay For Beverly Hills Field

A new gas zone was indicated for Beverly Hills field, Los Angeles County, but no development is contemplated at this time. Universal Consolidated Oil Co. 2 Twentieth Century-Fox flowed at a rate estimated to exceed 5,000 M.c.f. daily on a formation test at about 4,800 ft. Flow was through a 7/64-in. choke.

Following the test the well drilled ahead toward the Miocene oil pay discovered by 1 Twentieth Centruy-Fox last winter. At last reports, it was drilling below 5,200 ft., after a previous slanted hole was abandoned at 9,000 ft.

Tejon Ranch Pool Extended

Reserve Oil & Gas Co. completed 41-34 E. W. Pauley as a north offset and its third well in the 5,700-ft. Olcese pool at Tejon Ranch, Kern County. The well topped the sand at 5,615 ft. and cut 115 ft. of pay in drilling to 5,754 ft. Initial rate of production was 620 bbl. of 30°-gravity crude daily through a 22/64-in. choke.

Richfield Oil Corp. 53 Tejon-B again failed to find production after redrilling to 5,805 ft. in a hole slanted away from the Reserve discovery. The first hole was unsuccessful at 5,828 ft. After plugging back to 4,300 ft. the Richfield well had reached a redrilled depth of 4,690 ft. when a fishing job was encountered.

Guijarral Hills Outpost

Los Nietos Co. will seek to extend production in North Leda pool at Guijarral Hills, Fresno County. Its 38-22 Guijarral Service was staked in SE SW 22-20s-16e, ½ mile west of a recently abandoned 9,000-ft. test and slightly over ½ mile northwest of nearest Leda sand production. The Union Oil Co. subsidiary, acting as operator, evidently expects to find the pay structurally higher than did 88 Guijarral Service.

New Kern Wildcats

Among the wildcats preparing to get under way in Kern County were two in the Rio Bravo and Rosedale areas west of Bakersfield. The Texas Co. 1 Parallel will be an 11,000-ft. test in 36-28s-24e, 3 miles west of Rio Bravo. Standard Oil Co. of California 37-1 K.C.L.-31 will test oil possibilities below Rosedale's regular Lerdo sand pool. Location was staked in SE SW 1-29s-26e.

KANSAS

Mississippian Discovery Noted in McPherson

Southern McPherson County at the south end of Salina basin has a Mississippian oil discovery indicated at Lindas Oil Co. 1 Schroeder, SE NW SW 28-21s-3w, ¾ mile northwest of Hollo-Nikkel pool and ¾ mile south of Voshell pool. Dry holes lie in between.

A drill-stem test at 3,170-3,205 ft. recovered 560 ft. of free oil, 100 ft. oil and gas-cut mud and 120 ft. water.

Oil and Gas Shows Tested At Harper County Prospect

Encouraging drill-stem test at Musgrove Petroleum Corp. 1 Moldenhauer, SW SW SW 27-32s-7w, 11 miles southeast of South Grabs pool and 4½ miles southwest of Harper, indicated a possible Mississippian discovery for Harper County.

Recovery on a test at 4,455-80 ft. was 30 ft. slightly oil and gas-cut mud and 220 ft. heavy oil and gas-cut mud with 1,040 psi. bottom hole pressure. A previous drill-stem test at 4,434-55 ft. got 335 M.c.f. of gas per day and 110 ft. gas-cut mud with 1,540 psi. The Simpson also recovered 208 ft. of oil and gas-cut mud on a test at 4,849-80 ft.

WILDCAT COMPLETIONS

SOUTHWEST TEXAS

District 1

Atascosa County: B. G. Byers and C. G. Dunwoody 1 Vickers, Vinc Bluntzer Sur. 2, A-1256. Dry. TD 5,602 ft.

Sid Katz and R. H. Venable 1 Flory & Tracy, J. A. Navarro Sur., A-9. Dry. TD 3,881 ft.

H. H. McFarland and Selby Walker Corp. 1 Hurd, J. M. Walker Sur. 1090, A-908. Dry. TD 4,900 ft.

Texita Oil Co. et al. 2 Shook, John Gaston Sur. 283. Dry. TD 3,100 ft.

R. P. Trubey 2 Miers, Henry Hiner Sur., A-405. Dry. TD 5,384 ft.

Bastrop County: Gilcrease Oil Co. 1 Murchison, James Stuart Sur. Dry. TD 4,220 ft.

Frio County: Alaska Steamship Co., C. G. Dunwoody, and Gulf Oil Corp. 1 Groves, BS&F Sur. 200, A-693. Dry. TD 5,183 ft.

Gonzales County: Sutton Drilling Co. 1 Harris, William Page Sur., A-54. Dry. TD 1,992 ft.

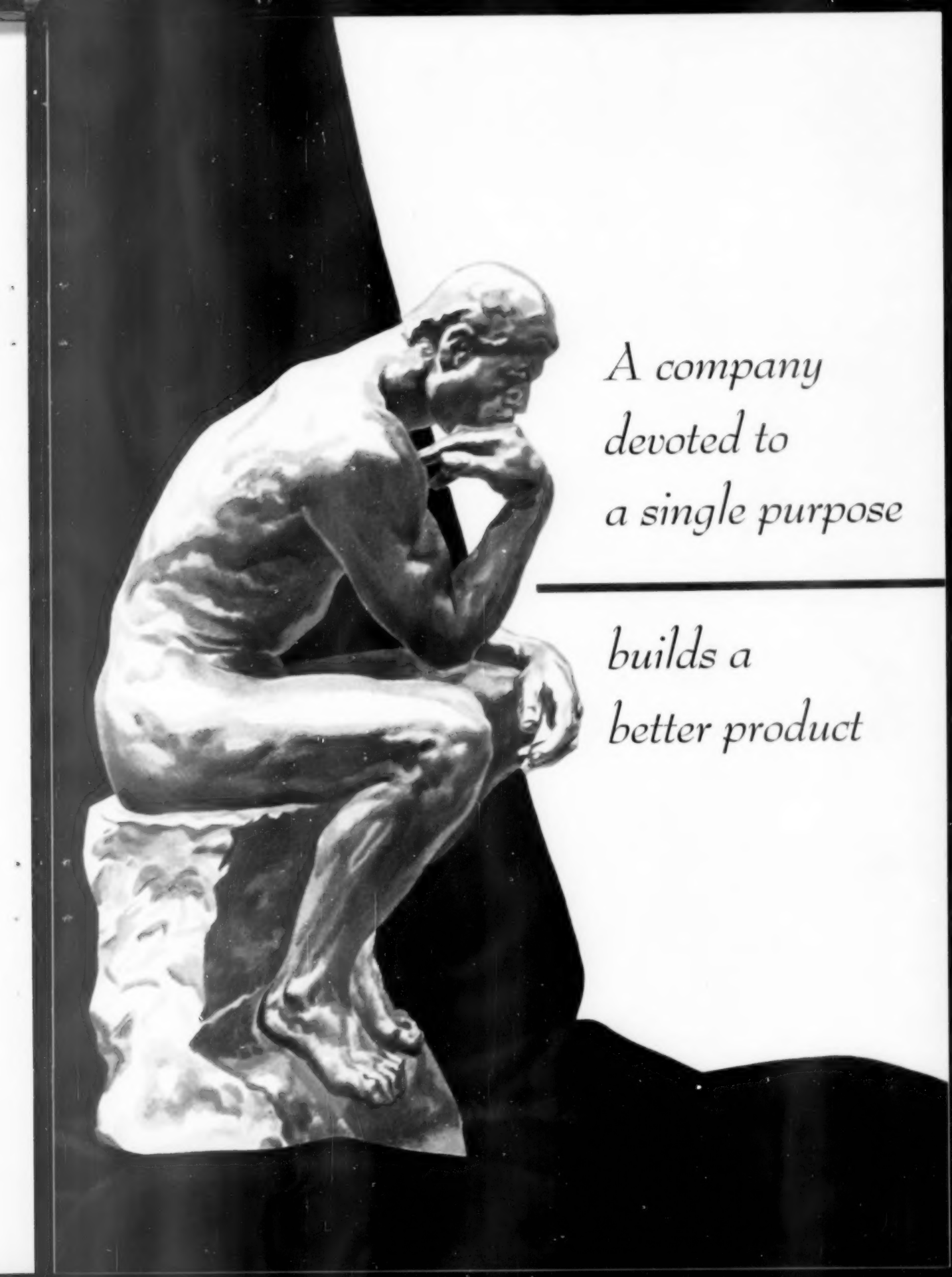
McMullen County: George H. Coates 1 Nueces, J. T. Moorehead Sur. 234, A-316. Dry. TD 1,773 ft.

Travis County: M. J. Simmons 1 Ennis, Thomas B. Westbrook Sur., A-520. Dry. TD 890 ft.

M. J. Simmons 3 Ennis, Thomas B. Westbrook Sur., A-520. Dry. TD 1,001 ft.

District 4

Jim Wells County: Haroldson L. Hunt, Jr., trust estate, 1 Wade, Lot 26, Wad Ranch Oil & Gas Subd., Jose Aldrete Sur., A-1024. Dry. TD 5,201 ft.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WILDCAT COMPLETIONS

Kenedy County: La Goria Oil & Gas Co. 1-C Kenedy, La Parra Grant, A-37. Dry. TD 8,505 ft.

San Patricio County: Southern Minerals Corp. 1 Anderson, Block 5, Toribio Molino Sur., A-18. Dry. TD 6,500 ft.

Willacy County: Superior Oil Co. 1 Yturria, San Juan de Carricitos Grant. IP 120.06 BOPD, 17/128-in., 42.7°, perforations 6,028-34 ft. TD 12,016 ft. (New field—La Sara.)

TEXAS GULF COAST

District 2

Jackson County: Sam G. Harrison 1 Mauritz et al., Lot 8, Bartell Subd., John Davis Sur., A-16. Dry. TD 6,415 ft.

Karnes County: John J. Coyle 1 Esse, James Priest Sur., A-228. Dry. TD 6,512 ft.

Live Oak County: Lloyd Parker and Cosden Petroleum Corp. 1 Maggie McNeill est., James Curry Sur., A-43. IP 84.3 BOPD, ¼-in., 40.2°, perforations 4,437-45 ft. TD 5,720 ft. (New field.)

Ussery Drilling Co. 1 Brown, John McMullen Sur., A-30. Dry. TD 5,605 ft.

Victoria County: Arnold A. Morgan et al. 1-A Atkinson, R. Amador Sur., A-1. Dry. TD 8,610 ft.

H. G. Spiller and W. P. Holloway 1 Airport, Manuel Zepeda Sur., A-128. Dry. TD 2,651 ft.

District 3

Fort Bend County: Carnes W. Weaver and A. W. Franke 1 Cook, M. Autry Sur., A-100.

Matagorda County: J. M. Huber Corp. 1 Thompson et al, Elisha Hall Sur., A-45. IP 141.50 BOPD, 10/64-in., 40°, Badough (Frio) sand 8,558-62 ft. (perforations). TD 10,510 ft. (New pay in Lucky field.)

San Jacinto County: Claud B. Hamill 1 Cruse, H&TC Sur. 101, A-165 (Keno prospect). Dry. TD 5,515 ft.

Wharton County: Continental Oil Co. 1 Frank Macha et ux, R. Boatright Sur., A-8. Dry. TD 7,931 ft.

Claud B. Hamill 1 Holub, ETRR Sur. 47, A-117. Dry. TD 7,677 ft.

EAST TEXAS

Anderson County: The Texas Co. 1 Arrington, W. M. Punchard Sur. A-624. Dry. TD 4,920 ft.

Cass County: Alton Coats 1 Cochran, M. D. Frazier Sur. A-354. Dry. TD 7,787 ft.

Cherokee County: Watburn Oil Co. 1 Thomason, T. C. Arrington Sur. A-66. Dry. TD 5,211 ft.

Kaufman County: John B. Stephens, Jr., et al. 1 McKinney, Lewis Netherland Sur. A-362. Dry. TD 5,298 ft.

Limestone County: W. A. Reiter et al. 1 Lown, W. M. Williams Sur. Dry. TD 2,260 ft.

W. A. Reiter et al. 1 Norris, H&TC Sur. Dry. TD 2,139 ft.

Zephyr Oil Co. 1 Kilpatrick, H. L. Thompson Sur. Dry. TD 3,040 ft.

McLennan County: G. M. O'Dell 1 Barnes, Jr., James Rose Sur. A-774. Dry. TD 419 ft.

W. W. Yeagley 1 Roberson, C. J. Carrier Sur. Dry. TD 352 ft.

TEXAS PANHANDLE

Hutchinson County: Huber 43 Weatherly, Blk. Y, Sec. 26, A&B Sur. IPP 40 BOPD, Panhandle dolomite 2,940-3,044 ft. TD 6,280 ft. (Geological wildcat.)

Roberts County: Clark Drilling Co. 1 O'Laughlin, M-2-94, BS&F. Dry. TD 4,168 ft.

WEST CENTRAL TEXAS

Brown County: Ralph Lea 1 Balliant, 15-3, BBB&C. Dry. TD 929 ft.

Callahan County: Frank Ausanka and AB Tex Drilling Co. 1 Caldwell, 16-5, SPRR. Dry. TD 2,990 ft.

A. J. Frazier et al. 1 Detrick et al., Geo Hancock Sur. 357. Dry. TD 2,000 ft.

Laan-Tex Oil Co. 1 Whitehead, 17, BBB&C Dry. TD 2,300 ft.

Jess Lord and L. L. Shell, Jr., 1 Higgins, 104-8, BBB&C. IPF 89 BOPD, Tannehill sand 1,174-81 ft., 16/24-in. TD 1,265 ft. (Oil discovery.)

Woodson Producin Co. et al. 1 Moore, Sec. 1, James W. Scott. Dry. TD 1,950 ft.

Woodson and Callihan Rotary Co. 1 Cutbirth, Batrola Garcia Sur. 208. Dry. TD 2,260 ft.

Woodson and Forrest W. Gregory 1 Beck, Wm. Carper Sur. 749. Dry. TD 1,930 ft.

Coleman County: Brannon & Murray 1 Roach, J. Thiele Sur. 4. Dry. TD 2,364 ft.

W. D. Frazell and AB-Tex Drilling Co. et al. 1 Parker, 26-2, T&NO. IPF 120 BOPD, Gray sand 3,610-14 ft, 37°, 24/64-in. TD 3,860 ft. (Oil discovery.)

J. W. Marshall 1 Jackson, 75, Wade H. Bynum Sur. 272. Dry. TD 2,116 ft.

F. Craig Morton 2 Shield, Wade H. Bynum Sur. 272. Dry. TD 2,332 ft.

Sorrellis & Mather et al. 1 Greenway et al. D. A. Murdock Sur. 738. Blk. 1. Dry. TD 2,325 ft.

Comanche County: A. C. Smith 1 Moore, Blk. 51, Lampasas CSL Sur. 1367. Dry. TD 3,003 ft.

Eastland County: J. E. Connally et al. 1 Lamkin, Thos. Mulryne Sur. A-377. Dry. TD 3,290ft.

Jones County: Gilchrist Drilling Co. 1 City of Abilene, 87-14, T&P. Dry. TD 2,287 ft.

Hack Drilling Co. 1 Brown-Snyder, Blk. 6, De Witt SCL Sur. 150. Dry. TD 5,252 ft.

Robinson-Puckett and Dan Auld 1 Bennett, 33, D&DA Sur. Dry. TD 3,713 ft.

Tayor County: J. E. Conay and AB-Tex Drilling Co. 1 J. M. Radford est., Sec. 37 BAL Sur. Dry. TD 3,412 ft.

Davis Bros. 1 Seymore, Sec. 4, Burr & Caswell Sur. Dry. TD 2,868 ft.

Hack Drilling Co. and Wayne Petroleum Co. 1 Roy and J. W. Hunter, 6-4, T&P. Dry. TD 4,078 ft.

Robinson-Puckett, Inc. 1 Ensor, 110-64, H&TC. Dry. TD 4,985 ft.

Throckmorton County: Burk Royalty Co. 1 Bird, 299, BBB&C. Dry. TD 4,967 ft.

Woodson Oil Co. 1-C J. C. Irwin, J. C. Irwin Sur. A-1273. Dry. TD 4,715 ft.

NORTH TEXAS

Archer County: Archer Drilling & Producing Co. 1 Prideaux, A-370. Dry. TD 739 ft.

A. D. Beck 1 Eschman, Blk. 3, Clark & Plumb Subd. Dry. TD 1,246 ft.

Enloe-Gibson et al. 1 Alsup, R. Newman Sur. A-330. IPP 20 BOPD, Cisco 1,086 ft., GOR 20, open hole, 35.4°. TD 1,091 ft. (Oil discovery.)

Lindsay & Duvall 1 Hoffman, Lot 31, Blk. 3, Clark & Plumb Subd. Dry. TD 1,302 ft.

Palmer Drilling Co. 1 Kinder, Blk. 53, Clark & Plumb Subd. Dry. TD 1 286 ft.

Harold Shappel 1 Petrex, Lot 3, Blk. 114, ATNCL Subd. Dry. TD 1,487 ft.

Baylor County: L. T. Burns est. 1 F. C. Green est., H&TB Sur. 7, A-161. IPP 75 BOPD, Miss. 5,433-45 ft., 43°. TD 5,452 ft. (Oil discovery.)

B. F. Schultz, Jr., Op. Co. 1 Cottingham, Sec. 23, Blk. 1 I&W Sur. IPP 65 BOPD, Tannehill sand 1,434-52 ft., 36.6°. TD 1,475 ft. (Oil discovery.)

Clay County: L. T. Burns est. 1 Willis heirs, Blk. 27, Halsell Subd. 2. IPP 75 BOPD, Caddo, 43°, 5,714-28 ft. TD 6,157 ft. (Oil discovery.)

Elmer Frerck et al. 3 Snowden, Sec. 7, MEP&P Sur. Dry. TD 1,863 ft.

Cooke County: Burt Oil Co. 1 Coffee heirs, J. M. Haney Sur. Dry. TD 4,130 ft.

Concho Petroleum Co. et al. 1 Mrs. Margeret Steed, Sec. 3, Univ. Lge. 7. IPF 199 BOPD, ¾-in., Strawn 4,046-4,500 ft., 36°. TD 4,100 ft. (Oil discovery.)

L. O. McMillan and Kay Kimbell 1 Cochran, Gideon Rose Sur. A-848. IPP 52 BOPD, 34°, 7,112 ft. TD 7,172 ft. (Oil discovery.)

T&T Oil & Gas Co. 1 Burch, J. McWilliams Sur. A-658. Dry. TD 4,460 ft.

The Texas Co. 1 Ray, T. Wisdom Sur. A-1167. Dry. TD 3,641 ft.

Denton County: Howell, Holloway & Howell 1 Lewter, B. F. Lynch Sur. A-725. Dry. TD 3,828 ft.

Grayson County: Seitz, Comegys & Seitz 3-C Anderson, J. Shelton Sur. A-1102. IPF 140 BOPD, sand 4,119-27 ft., 32°, 16/64-in. TD 5,088 ft. (Oil discovery.)

Shell Oil Co. 28 Green, E. C. Smithson Sur. A-1082. IPP 153 BOPD, Strawn discovery, 3,469-76, 3,482-91, 3,521-32 ft., 35°. TD 3,669 ft. (New pay in Big Mineral field.)

2 Steedman, Big Mineral field, IPF 258 BOPD, Strawn 7,061-75, 7,080-86, 7,090-7,116 ft., 29.8°, 24/64-in. TD 7,219 ft. (New pay in Big Mineral field.)

Jack County: Anderson Production Co. 1 Ester, N., P. Overby Sur. A-452. Dry. TD 3,510 ft.

Fain & McGaha 1 Riddle, Blk. 30, Wood CSL Sur. 380. Dry. TD 4,014 ft.

C. J. Wrightsman 1-B Perrin Ranch, J. W. Frazier Sur. A-214. Dry. TD 5,295 ft.

Montague County: Continental Oil Co. 12 McGaughy, C. Chacon Sur. A-143. IPF 430 BOPD, 1,769-83, 1,793-1,812, 1,890-99 ft., 1-in. TD 1,978 ft. (New pay in McGaughy-Ellenburger field.)

The Texas o. 1-A Walker, Sec. 8, Limestone CSL Sur. IPP 11 BOPD, 6,271-80, 6,223-38 ft., 37.1°. TD 6,299 ft. (Oil discovery.)

Jesse W. Wright et al. 1 Hill et al., Cummings Sur. Dry. TD 5,428 ft.

Wilbarger County: Dublin-Kiel 1-W W. T. Waggoner est., Sec. 21, Blk. 4, H&TC. Dry. TD 2,007 ft.

George W. Graham 1 Schlaffke & Robbe, Sec. 2, Blk. 14, H&TC. Dry. TD 3,312 ft.

Shanor & Wood 1-A W. T. Waggoner est., 7-5, H&TC. Dry. TD 1,950 ft.

Young County: Ada Oil Co. 1 The Allar Co., Frac. "D," TE&L Sur. 3410. Dry. TD 2,710 ft.

Childress Drilling Co. 1 Atcheson, M. B. Stafford Sur. A-1533 Temp. abd. TD 6,201 ft.

O. P. Leonard 1 Taylor, J. B. Wittenburg Sur. A-1282. IPF 148 BOPD, Strawn 3,094-3,100 ft., 38°, ⅛-in. TD 3,289 ft. (Oil discovery.)

Mallard Oil Co., Inc., 1 Graham, J. Poitevent Sur. A-227. Dry. TD 3,671 ft.

Ben H. Rankin and Ohio Fuel Supply Co. 1 Choate, John Marlin Sur. A-199. Dry. TD 3,350 ft.

Alan T. Strong et al. 1 Criswell, A. B. Ledbetter Sur. A-1689. IPP 14 BOPD, Strawn 3,134-44 ft., 39.4°. TD 3,657 ft. (Oil discovery.)

WEST TEXAS

Andrews County: Ralph Lowe 1 Southland Royalty Co. et al., 21-A-46-PSL. IPF 3,264 BOPD, top pay 12,173 ft. ¾-in. BOR 400:1, 43.8°. TD 12,394 ft. (Ellenburger discovery.)

Borden County: Trans-Tex Drilling Co.,

WILDCAT COMPLETIONS

Green & McSpadden 1 McKee, 23-33-T-3-N. Dry. TD 8,616 ft.

Howard County: Champlin Refining Co. 1 Myers, 8-33, T-2-N, T&P. Dry. TD 9,509 ft.

P. R. Rutherford 1 Carpenter, 8-25, H&TC. IPF 118 BOPD, 10/64-in., top reef 7,588 ft. GOR 1427:1, 45.5°. TD 7,608 ft. (Oil discovery.)

Kent County: General Crude Oil Co. et al. 99-1 Young, 99-G, W&NW. Dry. TD 7,404 ft.

Lamb County: Western Drilling Co. 1 White, Lab. 5, Lge. 682, State Capitol Lands Sur. Dry. TD 7,050 ft.

Midland County: Cities Service Oil Co. 1 Parks, 14-41, T-3-S, T&P. IPF 3,324 BOPD, 1-in., top pay 13,019 ft., GOR 1043:1, 51.2°. TD 13,083 ft. (Virey Ellenburger discovery.)

Pecos County: Drilling & Exploration Co. and R. H. Frizzell, Jr., and W. H. Thams 1 LaVerne L. Cressee 78-11, H&GN. Dry. TD 5,585 ft.

The Sharples Oil Corp. and Jos. I. O'Neill, Jr., 1 State-Lethoe, 4-142, T&STL. Dry. TD 3,235 ft.

Schleicher County: Buffalo Oil Co. 1-A Byrd, 22-H, GH&SA. Dry. TD 5,045 ft.

Humble 1 Reynolds, 42-I, GH&SA. Dry. TD 6,365 ft.

Moore & Gilmore and Bankline Oil Co. 1 Menkel, 67-TT. Dry. TD 7,012 ft.

Sutton County: Humble 1 Harrison, 115, CCSD&RGNG Sur. Dry. TD 8,220 ft.

Tom Green County: Phillips 1 Griffith "A," 52-25, H&TC. IPF 408 BOPD ½-in., top pay 4,776 ft., GOR 735:1, 35.4°. TD 5,970 ft. Strawn 5,380 ft. (Oil discovery.)

Ward County: Humble 1 State University "AC," 28-18, Univ. Lands. IPP 107 BOPD, top pay 5,124 ft., GOR 335:1, 36.7° TD 5,397 ft. (Oil discovery.)

WEST TEXAS BORDER

Coke County: Sid Katz and White Eagle Oil Co. 1 Copeland, 281-1-A, H&TC. Dry. TD 7,052 ft.

Sid Katz Exploration Co. et al. 2 Rawlings et al., Casimera Rubio Cur. Dry. TD 7,012 ft.

Fisher County: Mid-Continent Petroleum Corp. 1 Gilbert, 260-3, H&TC. Dry. TD 6,750 ft.

Morris Mizel 1 Willingham, 84-1, H&TC. Dry. TD 6,215 ft.

Sojourner Drilling Co. 1 Deere, 36-1, HT&B. Dry. TD 6,271 ft.

Ted Weiner et al. 1 Stuart, 19-1, HT&B. Dry. TD 6,456 ft.

Nolan County: General Crude Oil Co. 1 Cave, 249-64, H&TC. Dry. TD 6,612 ft.

Sinclair 1 GCSFRR, 36-22, T&P. Dry. TD 6,521 ft.

Texas Pacific Coal & Oil Co. 1 Clayton, 27-20, T&P. Dry. TD 6,554 ft.

Runnels County: Gulf Oil Corp. 1 Pumphrey, 83-64, H&TC. Dry. TD 5,370 ft.

Lucerna Corp. 1 Ocker, W. R. Jackson Sur. 2. Dry. TD 5,025 ft.

Stonewall County: Texas Pacific 1 Gholson "C," 68-D, H&TC. Dry. TD 6,320 ft.

SOUTHEAST NEW MEXICO

Chaves County: Cain & Adams 1 Elliott, 26-10s-25e. Dry. TD 1,280 ft. lime.

NORTHERN NEW MEXICO

Colfax County: Continental Oil Co. 1 Maxwell Land Grant Co., NW NW NW 14-28n-22w. Dry. TD 2,939 ft. Pre-Cambrian.

Rio Arriba County: Southern Union Gas Co. 1-"D" Jicarilla, SE NW NW 32-26n-3w. IP 386 M.c.f. of gas per day, Pictured Cliffs discovery, new field. TD 3,884 ft.

Southern Union 1-E Jicarilla, SE NW SE 16-26n-4w. IP 3,134 M.c.f. of gas per day, Pictured Cliffs discovery, new field. TD 3,465 ft.

Southern Union 1-H Jicarilla, SE NW NW 20-26n-4w. Dry. TD 3,348 ft.

San Miguel County, East Las Vegas: Continental 1 Shoemaker-Reed, E½ SW NE 28-17n-18e. Dry. TD 4,519 ft. Pre-Cambrian.

ILLINOIS

Bond County: L. Truitt 1 Perkins, SW SE NE 26-5n-2w. Dry. TD 1,500 ft.

Christian County: O. A. Reed 1 Shumway, NE NE NE 7-13n-1e. Dry. TD 2,372 ft.

Clinton County: Davis-Menhall 1 Hartman, SW SW SW 31-3n-1w. Dry. TD 1,382 ft.

L. Kapp 1 Netemeyer, NE NE SW Fr. 31-3n-2w. Dry. TD 1,224 ft.

Hamilton County: Nash Redwine 1 Tyler, NW SW NW 1-6s-7e. Dry. TD 3,383 ft.

Jefferson County: Strickland 1 McDuffey-Champ, NW NE NW 11-2s-1e. Dry. TD 2,111 ft.

Macoupin County: Carline Wilson 1 Schroeder, NW NW NW 21-7n-9w. Dry. TD 1,100 ft.

Marion County: Superior Oil Co. 1 Williams, SE SW SE 22-2n-1e. Dry. TD 4,707 ft.

Saline County: George & Wrather 1 Sronce, NW SE NW 15-8s-6e. Dry. TD 2,865 ft.

Shelby County: H. Robison 1 Eberspacher, SE SE NW 29-12n-2e. Dry. TD 1,563 ft.

Washington County: Fisher & Carter 1 Krueger, NE SW SE 1-1s-2w. Dry. TD 1,506 ft.

Gulf Refining Co. 1 Huck, SW SW NE 21-1s-2w. Dry. TD 2,990 ft.

WESTERN KENTUCKY

Butler County: Marhill Oil & Gas Co. 1 Appling, NE SE NW NW 18-H-34. Dry. TD 219 ft.

MICHIGAN

Isabella County: Neyer, Miller & Gallagher 2 Powell, NW SW NE 30-16n-5w. Dry. TD 3,895 ft. in Dundee.

Mason County: Max Spidel 1 Ehler, SE SE SW 11-19n-18w. Dry. TD 2,121 ft. in Dundee-Reed City zone.

Oceana County: Socony-Vacuum Oil Co., Inc., 1 Flood, SW SE SE 8-15n-18w. Dry. TD 2,165 ft. in Dundee.

WEST VIRGINIA

Nicholas County, Hamilton district: Hope Natural Gas Co. 9725 Scott Morris, elev. 1,923 ft. Dry. Onondaga 6,777 ft., chert 6,793-6,928 ft., show gas 6,901-05 ft., Oriskany sand 6,928-84 ft. TD 7,208 ft.

Randolph County, Middle Fork district: Bobray Exploration Co., 2 Chester C. Housh, elev. 2,053 ft., 600,000 cu. ft. gas, Fifth sand 1,436 ft., gas 1,436-45 ft. TD 1,515 ft.

ALABAMA

Geneva County: Sunnyland Contracting Co. and Stanley-Daws 1 Wilson et al, C NE SE 9-1n-20e. Dry. TD 4,593 ft. Elev. 176 ft., lower Cretaceous 4,050 ft.

MISSISSIPPI

Bolivar County: Seaboard Oil Co. 1 Chicago Mill et al, 9-23n-8w. Dry. TD 4,785 ft.

George County: Southern Production Co. and Crow Drilling Co. et al, C SE SW 11-1s-5w. Dry. TD 8,307 ft. Elev. 133 ft., lower Cretaceous 8,172 ft.

Jefferson County: B. Serio and Punches Oil Co. 1 Stewart, 25-9n-1e. Dry. TD 6,511 ft. Elev. 283 ft., Wilcox 3,737 ft., Artman 5,480 ft., Pearline 5,538 ft.

SOUTH LOUISIANA

Beauregard Parish: J. M. Flaitz and R. B. Mitchell 1 Long Bell, 29-5s-9w. Dry. TD 8,750 ft.

F. W. Michaux and Bel Oil Corp. 1 White, 30-5s-10w. Dry. TD 8,416 ft.

Cameron Parish: Magnolia Petroleum Co. 1 Cox, 32-12s-7w. Junked hole. TD 3,590 ft.

Iberville Parish: Continental Oil Co. 1 Natalbany, 19-9s-2e. IP 130 BCPD and 20,000 M.c.f. daily, 10/64-in., 54°, perforations 7,704-13 ft. TD 9,500 ft. (New pay in St. Gabriel field.)

St. Bernard Parish: The Texas Co. 1 State Lease 2461, Block 29, Chandeleur Sound. IP 500 M.c.f. daily (estimated), 7/64-in. dry gas, perforations 7,013-22 ft. TD 9,564 ft. (New field.)

St. Landry Parish: BBM Drilling Co. 1 Dalfrey, 82-6s-4e. Dry. TD 11,850 ft.

NORTH LOUISIANA

Caddo Parish: Atlantic Refining Co. 1 Eubanks, 1-23n-15w. Dry. TD 7,451 ft. Travis Peak 6,886 ft.

Lincoln Parish: Southwest Gas Producing Co. and W. C. Feazel 1 Redwine, 11-17n-3w. IP 500 M.c.f., "D" sand 10,070-10,146 ft. TD 10,638 ft. (Discovery Clay field.) OWWO.

ARKANSAS

Lafayette County: Crowe Drilling Co., Inc., 1 Moore, C SW NW 22-19s-26w. Dry. TD 7,106 ft.

Union County: L. E. Tennyson, Jr., 1 Murphy, C NE SW NE 27-16s-16w. IPP 5 BOPD, Blossom 2,655-59 ft., 24°. TD 3,205 ft. (Oil well).

OKLAHOMA

Beaver County: Sinclair Oil & Gas Co. 1 Knight, SW SW NW 22-3n-23eCM. Dry. TD 7,466 ft.

The Texas Co. 1 Hauge, C SW NE 29-6n-20eCM. Dry. TD 6,600 ft. Miss. lime 6,354 ft.

Huber 2 Potter, C NW NW 26-6n-21eCM. IPP 92 BOPD, Morrow 5,632-65 ft. (Oil discovery in Light area.)

Creek County: Hayes-Varser 1 Stevenson, SE NW NE 3-18n-9e. IP 1,000 M.c.f. of gas per day, Prue sand 1,830-38 ft. TD 2,914 ft. (Gas discovery.)

Garfield County: E. P. Halliburton 1 Lukenbaugh, SW SW NE 19-21n-3w. Dry. TD 6,232 ft.

Garvin County: Thompson Drilling Co. 1 Harris, SW SW NE 25-4n-3e. Dry. TD 1,821 ft.

Jefferson County: Don C. Lamb 1 Baker, NE SW SW SE 26-3s-4w. Dry. TD 741 ft.

Osage County: J. R. Porter 1 Osage, SW NE NE 4-23n-3e. Dry. TD 4,151 ft.

Booth 1 Osage, NE SW NE 10-23n-9e. Dry. TD 2,221 ft.

Pawnee County: Mohawk Drilling Co. 1 Griesel, SE SE NW 18-21n-5e. Dry. TD 3,860 ft.

Pottawatomie County: Teas-Cox-Hancock 1 Hudspeth, NE NE NW 4-6n-3e. Dry. TD 450 ft.

Kemp 1 Uzelok, SW NW SW NW 36-1n-17e. Dry. TD 456 ft.

Rogers County: Rainbow Drilling Co. et al. 1 Knori, E½ NE SE NW 25-24n-15e. Dry. TD 1,118 ft.

Seminole County: Graybol 1 Harris "D," NE SW SW 5-5n-7e. Dry. TD 1,986 ft.

Texas County: United Producing Co. 1 Harrison, C NW SE 25-2n-19eCM. IP 21,500 M.c.f. of gas per day, Morrow 6,755-80 ft. TD 6,815 ft. (Gas discovery.)

(Continued on page 162)

Chrichton Climbing

Head of Dallas company engineers big purchase

FEW men in the oil industry today can claim so rapid a climb to the top as John A. (Jack) Chrichton, president of Oil & Gas Property Management, Inc., Dallas.

In 1938 Chrichton was working as a swamper for a Shreveport drilling contractor. Last month, as head of Oil & Gas Property Management, he engineered a $118,500,000 purchase of the oil and gas properties of the defunct Panoma Corp.

Chrichton is only 38 years old, yet his oil and gas experience rivals that of anyone in the industry.

He credits much of his success to the help and advice early in his career of N. C. McGowen, a close friend of his father and president of United Gas Corp., United Gas Pipe Line Co., and Union Producing Co.

It was McGowen who advised Chrichton to attend Texas A. & M. or Oklahoma University. Chrichton chose A. & M. and received his B.S. degree in petroleum engineering in 1937.

Again it was McGowen who got Chrichton a summer job as a swamper with Dick Nowery, a Shreveport drilling contractor then drilling for United in Rhodessa field in Louisiana. Chrichton recalls with amusement that when he reported for work, Nowery growled, "What a contractor has to go through to get a contract."

Attends M.I.T. . . . Chrichton entered Massachusetts Institute of Technology in the fall of 1937 and the next year he received his master's degree in petroleum engineering with a minor in geology. He joined Union Producing Co. as a geologist in 1938.

In 1941 Chrichton quit Union to enlist in the field artillery as a first lieutenant. Later, he transferred to the air force and served first as a glider pilot then in the air force intelligence. After a tour of duty in Europe, he was discharged from active service in January 1946 as a lieutenant colonel and he now holds a colonel's rank in the reserve.

He rejoined Union Producing briefly, resigning in May 1946 to join DeGolyer & MacNaughton, Dallas consulting firm, as a petroleum engineer and geologist. He was elected vice president and a director of the firm in 1950.

He resigned this position in January 1951 to help organize San Juan Oil Co., Dallas. He was vice president of this company in charge of drilling, development, and production until August 1952 when he resigned to become president of Oil & Gas Property Management.

He also is vice president of Empire Trust Co., New York, and president of Dorchester Corp., a subsidiary which was formed to operate the properties acquired from former Panoma Corp. stockholders last month *(The Oil and Gas Journal, July 12, page 80)*.

Fast growth . . . Oil & Gas Property Management has grown under Chrichton's leadership to a firm which controls a daily production of about 6,000 bbl. of oil and 200,000,000 cu. ft. of gas from approximately 600 wells, plus an output of about 170,000 gal. daily of natural gasoline.

Chrichton is an outdoor man. He is an accomplished golfer and a tennis enthusiast. He is a member of the Preston Hills Tennis Club in Dallas, and advanced to the semifinals in the club's July 4 tournament. He played varsity tennis and golf in college.

Chrichton has served as chairman of the North Texas section of the American Institute of Mining and Metallurgical Engineers, as local chairman of the Independent Petroleum Association of America in Dallas, as director and chairman of the board of the Dallas Engineers Club, and as president of the Dallas Petroleum Engineers Club. In addition, he has been active in the American Association of Petroleum Geologists, Dallas Geophysical Society, Dallas Geological Society, and Texas Society of Professional Engineers.

He is a member of the Highland Park Presbyterian Church. His family includes his wife, Marilyn, and a daughter, Anne Alston, who'll be a year old this month.

Earle S. Lougee, formerly with Greenbriar Oil Co., in Fort Worth, has joined Spartan Drilling Co. and the Grady Vaughn interests in Dallas as production superintendent. Lougee, before joining Greenbriar, had worked in the engineering and production department of the old Barnsdall Oil Co. and for a short time with Sunray Oil Corp., after Barnsdall merged with Sunray.

Virgil F. Bowyer, assistant to the president of Peoples Natural Gas Co., Pittsburgh, Pa., has been appointed manager of gas supplies for Consolidated Natural Gas Co., Peoples' parent company. He will handle gas supplies for the Consolidated system. Bowyer, who joined Peoples 30 years ago, served as assistant director of District 1, Petroleum Administration for War, during 1941-43 and as assistant director of the natural-gas production and processing division of the Petroleum Administration for Defense during 1951-52.

F. W. Stewart has been named Oklahoma City representative for the crude-oil supply division of Cities Service Oil Co. He formerly held a similar position at New Orleans.

D. D. Dillingham, formerly superintendent of the western pipeline division of United Gas Pipe Line Co., has been promoted to superintendent of operations for United. **Paul Williams,** veteran engineer with United, has been appointed chief engineer of United and Union Producing Co. **J. D. Davis,** district manager of United and Union at Jackson, Miss., has been named superintendent of the western pipeline division succeeding Dillingham.

E. R. Senac, former district enginer with Tide Water Associated Oil Co. at Lafayette, La., has been promoted to assistant district production superintendent. Other changes announced by Tide Water include: **W. E. Grolemund,** promoted from area engineer at Venice, La., to area production superintendent

PERSONALS

at Houma, La.; **L. D. Lott,** formerly area engineer at Conroe, Tex., advanced to district production superintendent at Victoria, Tex.; **A. G. Metcalf,** former field engineer at Kilgore, Tex., promoted to area engineer at Conroe, Tex.; **J. C. Broom,** former field engineer, promoted to area engineer at Venice, La.; **W. C. Pfister,** former area engineer, promoted to district engineer at Lafayette.

John W. Erickson has joined the geological staff of Gulf Oil Corp. at Casper, Wyo. Erickson formerly was geologist for Chemical & Geological Laboratories, Denver.

Charles B. Pollock, petroleum engineer, has returned to Stanolind Oil & Gas Co. after 2 years active duty with the Navy. He is stationed in the company's division office in Casper, Wyo.

W. L. FANNING

William L. Fanning, Jr., has been appointed supervisor of the crude and products section of Tide Water Associated Oil Co.'s eastern division in New York. He succeeds **Harold F. Parsons,** who has retired after 37 years with Tide Water. **J. H. Brown** has been assigned to the general administrative duties formerly handled by Parsons in connection with Tide Water Pipe Co., Ltd., and Bradford Transit Co.

W. A. Castille, area civil engineer for California for Humble Oil & Refining Co., has been transferred to Houston as senior supervising engineer in the civil engineering division. **Monroe R. Wolters,** whom Castille succeeds, will take Castille's position on the West Coast. In other Humble production department changes, **W. J. Barrett,** superintendent of the Government Wells district, named superintendent of the new Aransas district; **R. W. Roach,** assistant to Barrett, has been named acting district superintendent; **E. L. Campbell,** farm boss, has been named acting district superintendent at Government Wells; **H. T. Wright,** has been promoted from petroleum engineer to senior petroleum engineer in the Stratton district; and **Lee N. Perry, Jr.,** civil engineer in the East Texas division office, has been named civil enginer in the Athens district.

Max Farrell, district geologist for Carter Oil Co. at Casper, Wyo., has been transferred to Billings, Mont., as district geologist.

Alvin L. Backlund, Jr., geologist, has been transferred by Magnolia Petroleum Co., from Lake Charles, La., to New Orleans.

Ashton B. Geren, Jr., geologist formerly with D. J. Simmons, Farmington, N. M., has opened offices in San Antonio as an independent.

Joseph B. Currie is the new head of light oil treating unit at Esso Standard Oil Co.'s Bayway refinery, Linden. He succeeds **Andrew J. Sajko,** who retired. Currie, assistant unit head since 1945, has been with Esso 40 years, serving a portion of that time in Colombia and France.

William R. Haynes has been elected president of Mikton Oil Co. of Houston. Haynes, a director and former secretary-treasurer of the firm, is also vice president and director of Texas Pioneer Oil Corp., and assistant secretary-treasurer and director of Fifteen Oil Co.

Floyd F. Bayer and **Ferro Williams** have been appointed senior vice presidents of Tide Water Associated Oil Co. Bayer, vice president in charge of the company's western division for several years, has been with the company since 1916. Williams, Tide Water controller, was elected a director in 1952 and a vice president in 1953. Both are headquartered in San Francisco.

E. Clarence Oden has resigned as chief process engineer at the Lake Charles, La., refinery of Cities Service Refining Corp. to become a consulting chemical engineer in Lake Charles. He has been with Cities Service since 1944 and before that was with Mathieson Chemical Co., U. S. Rubber Co., and United Color & Pigment Co.

P. N. Gammelgard, general manager of refining for Pure Oil Co., has been promoted to the post of vice president in charge of refining. Gammelgard joined Pure in 1934 as a trainee in the refining department. **Dr. Kenneth M. Watson,** director of research for Pure, has been advanced to vice president in charge of research and development. Watson, a veteran of nearly 20 years service in the oil industry, joined Pure in 1952.

C. B. Smith, Jr., division geophysicist at Casper for Continental Oil Co., has been appointed acting assistant regional geophysicist with headquarters in Denver. **C. M. Feeree,** geophysical supervisor at Denver, has been made acting division geophysicist at Casper.

Dr. G. S. Schaffel has been named manager of research for Brea Chemicals, Inc., Los Angeles, subsidiary of Union Oil Co. of California. Since 1946 Schaffel has been involved in chemical research and chemical production for General Tire & Rubber Co.

Charles C. Frye has been named chief engineer for Hudson's Bay Oil & Gas Co., Ltd., Calgary, Alta. Frye has been regional petroleum engineer for Continental Oil Co. in Denver since 1948. He has been with Continental since 1933.

Bill Hershelman has been named division manager at Denver and **Bob Mallory** division manager at Casper, Wyo., by The Chicago Corp. The company's former Rocky Mountain region headed by **Jack L. Rune,** now executive vice president at Enid, Okla., has been split into the two divisions. **Waymon Davis** has been promoted from division engineer at Corpus Christi to senior petroleum engineer at Fort Worth. **Bill Dudley,** formerly assistant division engineer at Corpus will replace Davis as division engineer. Other Chicago personnel shifts include: **Jack Culberson,** transferred from the company's Corpus Christi engineering department to its coast district as engineer; **Weldon Williams,** from operations supervisor of the coast district production department to petroleum engineer at Fort Worth; **James T. Law,** from district engineer of the coast district to petroleum engineer in the Corpus district engineering office; **John T. Miller,** from drilling superintendent at Corpus to Casper as operations supervisor of the Casper district production department; and **Ralph Parks,** from geophysicist at Casper to Denver in the same capacity.

PERSONALS

James F. Hayes, geologist with Stanolind Oil & Gas Co., has been transferred from Lake Charles, La., to Houston.

Scott H. Phillips, former instructor at the University of Illinois, has joined The California Co. as a production geologist at Denver.

James T. Walker has been transferred from the Wichita offices of Vickers Petroleum Co. to Denver. Walker will be district geologist in the first Colorado office established by the company.

Thomas W. Moore has been appointed assistant manager of the coordination and petroleum economics department of Standard Oil Co. (N.J.). Prior to this appointment Moore had been assistant general manager of the supply department of Esso Standard Oil Co.

R. J. Dinning of Calgary, Alta., president of Burns & Co., Ltd., has been appointed a member at large of the provincial board of directors under the Alberta Gas Trunk Line Co. Act. This completes the roster of seven persons who will be the provincial directors and who will constitute, with the shareholders, the Alberta Gas Trunk Line Co.

Marvin H. Morris has been named division manager in charge of a new division office being opened in Lafayette, La., by Texas Gas Exploration Corp. Morris formerly was associated with Arkansas Fuel Oil Corp. and The Texas Co. Texas Gas, before this year known as Louisiana Natural Gasoline Corp., is a wholly owned subsidiary of Texas Gas Transmission Corp.

M. I. Taylor and **E. A. Weichert,** formerly assistant division production supervisors at Fort Worth for Gulf Oil Corp., have been named zone superintendents of production by the company under a new organization plan. Taylor will be superintendent of Gulf's Zone 8 at Roswell, N. M., which takes in 18 eastern New Mexico counties and 12 West Texas counties. Weichert will be superintendent of Zone 6 at Amarillo. Headquarters for the latter area formerly were in Borger, Tex. Gulf also named four new zone managers of exploration. They are: **W. L. Brown,** at Midland, Tex.; **George H. Pratt,** at Amarillo; **W. G. Sinclair,** at Wichita Falls; and **E. S. Grear,** at Roswell. These men, all former land men, will be in charge of all exploratory activity in their respective areas.

T. H. Sandoz, former district superintendent for Pan American Production Co. at Easton, La., has been transferred to Snyder, Tex., as district superintendent. **K. R. Rowley,** former district superintendent in Willamar field, South Texas, has been transferred to Charenton, La.

Lynn D. Ervin has been appointed vice president in charge of the Oklahoma City office by Geophysical Consultants, Inc., Tulsa. Ervin had served with Stanolind Oil & Gas Co. as geophysical supervisor in the company's central division.

Charles Stover has been promoted by Champlin Refining Co. from chief gager to manager of crude-oil pipelines, **Roy Collier** from chief engineer to manager of products pipelines, **Kenneth Potter** from pipeline accountant to manager of crude-oil purchases, and **Wallis Ice** from dispatcher to assistant manager of products pipelines.

C. K. Sheperd, acting regional exploration manager for Continental Oil Co., has been elected president of the Denver Geophysical Society. **E. B. Wasson,** geophysicist for The California Co., has been elected vice president, and **J. R. Reeves,** chief geophysicist for Aurora Gasoline Co., secretary-treasurer.

Paul E. Hurley, manager of Shell Oil Co.'s refinery at Norco, La., has been named manager of Shell's Houston refinery. Hurley, manager of the Norco refinery since 1945, will succeed **M. P. L. Love,** who has been given special assignment aboard. **Roy W. Faulk,** superintendent of the Norco refinery the past 18 months, will succeed Hurley as the Norco manager.

F. W. Hertel has been promoted by Tide Water Associated Oil Co. from general superintendent of the coastal division with headquarters in Ventura to division manager of production with headquarters in San Francisco. **W. D. Goold,** production superintendent at the Ventura office, has been promoted to general superintendent of San Joaquin Valley and Los Angeles Basin area with headquarters in Santa Fe Springs. **G. O. Suman,** formerly in the valley division, will succeed Hertel. Goold's successor has not been named.

John W. Meyer, Los Angeles independent, has been elected vice president of Swan-Finch Oil Corp., and **Robert F. Six,** president of Continental Airlines, has been elected chairman of the board in a company reorganization. **H. F. Moncrieff** remains as president of the firm.

Don McGee has been named assistant to **Millard K. Neptune,** president of Egyptian-American Oil Co. McGee, who has been in Continental Oil Co.'s production department in Ponca City, Okla., for the past 6 years, will remain in Ponca City. Egyptian-American was formed recently by Continental, Ohio Oil Co., Cities Service Oil Co., and Richfield Petroleum Corp.

DEATHS

Leo R. Brammer, 61, died recently in Tulsa. Brammer, receiver for Tulsa Oil Products Co., at the time of his death, was widely known throughout the Mid-Continent area for his work in marketing refinery products.

Walter M. Cross, Jr., 50, president of Cross Laboratories, Inc., Kansas City, died July 25 following a fall in his home. Cross took over the company from his father, who in 1911 developed the Cross process for making gasoline from crude oil. Recently Cross had conducted research in methods of transporting solid chemicals by pipeline.

Jacob Emery Wyatt, 64, president of Chanute Refining Co. and Consolidated Fuel Oil Co., Inc., died recently at his home in Kansas City following a heart attack.

J. H. Pollard, 78, retired foreman for The Texas Co. in Dallas, died in Dallas July 24.

Sam Ginsberg, about 70, independent Michigan operator, died July 23 in the Clare, Mich., hospital of a heart ailment.

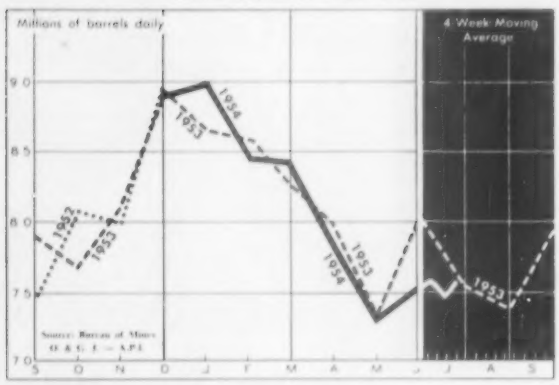
Joseph C. Stiedle, 82, retired vice president and treasurer of Standard Oil Co. (Ky.), died July 21 in Louisville. Stiedle started his oil career in 1888 as an office boy for Vacuum Oil Co., a Standard subsidiary, in Cincinnati. He later joined Standard's office in 1898, and remained with the company until his retirement in 1942.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,247,900	DOWN	20,400	DOWN	381,327
Crude stocks	277,748,000	UP	552,000	DOWN	1,881,000
Completions	1,142	UP	157	UP	97
Refinery runs	6,774,000	DOWN	195,000	DOWN	351,000
Gasoline stocks	158,844,000	DOWN	2,942,000	UP	17,136,000
Four-product stocks	341,910,000	UP	1,657,000	UP	23,613,000
Total imports	1,157,300	UP	178,500	UP	314,700

TOTAL DEMAND – ALL OILS



Reduction in Refinery Runs Gives a Better Tone to Gasoline Markets

ANNOUNCED reductions in refinery runs by many of the larger refiners have tended to bolster product markets in most areas. Regular gasoline on the Gulf Coast increased another 0.25 cent a gallon. Higher prices were reported on July 26. This latest increase brings the cargo price for 87-octane regular to 10.25 cents a gallon.

The over-all gain of 0.5 cent a gallon in the past 2 weeks has had a stabilizing influence on gasoline markets generally, but the current price is still much too low for profitable marketing. The cargo price for regular was 10.75 cents a gallon just before the increase in crude prices in June 1953 and 11.5 cents after the 25-cent crude increase. The Gulf Coast market took the deepest cuts in gasoline prices since the first of the year, and if markets move back nearer to normal, the greatest improvement should be on the Gulf Coast.

Cuts in refinery runs . . . Refiners cut crude throughput to 6,774,000 bbl. daily for the week ended July 23, a reduction of 195,000 bbl. daily from the previous week. However, production of gasoline was not reduced proportionately. Total crude input for the 7-day period was reduced 1,365,000 bbl. With normal yield of about 43 per cent gasoline from crude, the reduction in gasoline production should have been about 590,000 bbl. for the week. The actual cut reported for refinery output of gasoline was only about 270,000 bbl.

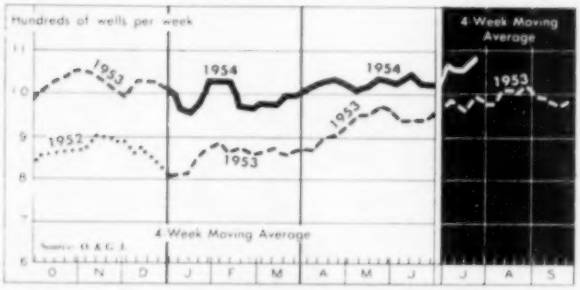
Refinery runs averaged 6,967,000 bbl. daily for the 4-week period ended July 23, compared with 7,133,000 bbl. daily for the corresponding weeks last year.

Gasoline stocks . . . Finished and unfinished gasoline stocks totaled 158,844,000 bbl. on July 23 for a reduction of 2,942,000 bbl. for the week. Current gasoline inventories are 17,136,000 bbl. more than at this time last year. The gain over the previous year reported for June 25 was 22,383,000 bbl. On a direct comparison with last year's performance, gasoline stocks have been cut an extra 5,000,000 bbl. in the past 4 weeks. It is this apparent better showing that may give some refiners a false interpretation of current conditions.

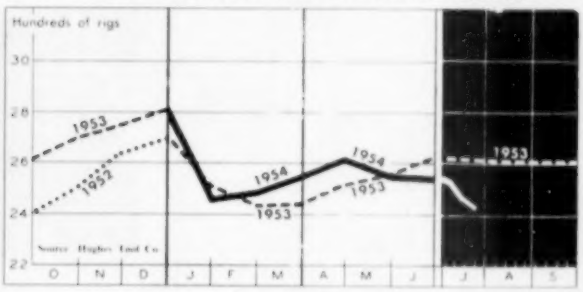
It was the failure to reduce gasoline inventories at a normal rate in July and August of last year that left many refiners with near-full tanks at the end of the season when stocks should have been reduced to near working inventories. Gasoline stocks at the end of September 1953 were about 23,000,000 bbl. more than a year earlier. Since a large part of the end-of-the-season surplus was due to excessive production in July and August, the small average stock reduction for these months is not a good standard to use in measuring the results of the attempt to reduce stocks this summer.

If gasoline stocks are to be down to about 130,000,000 bbl. by the end of September, the weekly reductions will have to average almost 3,000,000 bbl. If runs can be held to the level of the week ended July 23 and yields kept below 43.5 per cent, the needed reduction can be made.

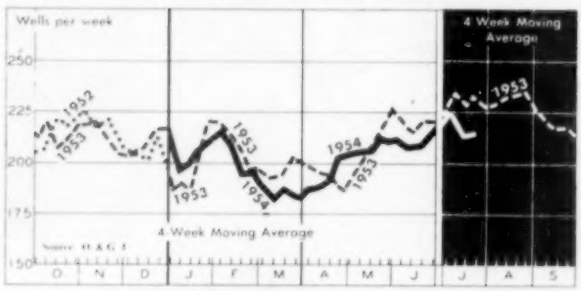
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

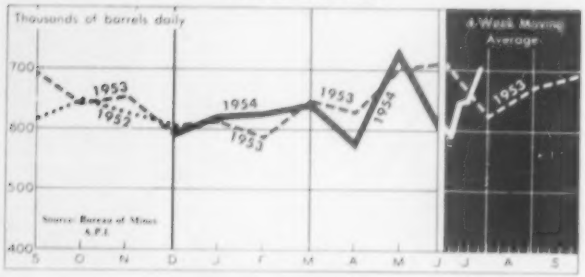
Area—	7-26-54	Change from 7-19-54	Change from 7-27-53
Gulf Coast	544	— 2	— 21
N. and W. Texas-New Mexico	750	—28	— 40
Arkansas-N. Louisiana-E. Texas	158	—18	11
Oklahoma	307	— 26	— 21
Kansas-S. Nebraska	164	— 5	— 3
Illinois-Eastern	122	—19	— 34
Rocky Mountain	256	3	— 10
Pacific Coast	121		— 51
Total United States	2,422	—43	—169
Western Canada	167	19	— 2

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 24, 1954

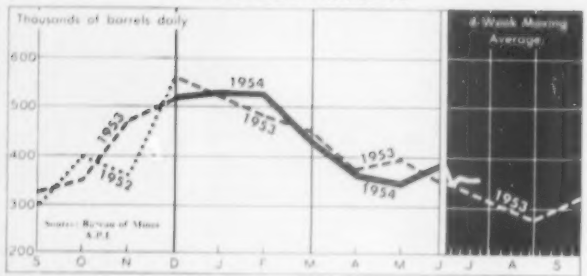
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	0	0	1	4,593	62	81	0	0	0	1	1	2	0	2	52	56
Arkansas	12	7	0	5	37,594	358	273	1	0	0	1	2	17	0	4	61	82
California	49	37	2	10	267,558	1,385	1,462	1	0	0	9	10	40	1	8	296	345
Colorado	27	10	2	15	146,715	744	333	0	0	1	9	10	22	0	10	280	312
Illinois	66	35	0	31	145,313	1,569	1,021	0	0	0	12	12	6	0	0	223	229
Indiana	17	7	0	10	29,032	444	700	0	0	0	0	0	5	0	0	85	90
Kansas	84	45	8	31	289,192	2,533	2,792	2	0	0	11	13	46	0	10	333	389
Kentucky	22	10	0	12	30,679	638	586	0	0	0	1	1	11	0	3	59	73
Louisiana	48	31	6	11	306,699	1,919	1,458	1	1	2	5	9	60	36	20	181	297
North	24	17	3	4	73,863	1,048	599	0	0	1	1	2	6	3	7	72	88
South	24	14	3	7	232,836	871	859	1	1	1	4	7	54	33	13	109	209
Michigan	9	3	0	6	23,846	307	319	0	0	0	3	3	11	0	0	124	135
Mississippi	7	2	0	5	52,190	226	213	0	0	0	3	3	5	0	0	82	87
Montana	13	6	2	5	32,650	166	225	1	0	0	3	4	3	0	1	45	49
Nebraska	6	3	0	3	33,061	200	192	0	0	0	1	1	12	0	3	63	78
New Mexico	26	5	14	7	103,862	619	755	0	0	2	4	6	10	0	12	68	90
North Dakota	11	8	0	3	78,711	153	146	1	0	0	3	4	4	0	0	54	58
Ohio	26	8	6	*12	64,102	653	575	0	0	0	0	0	3	0	4	9	16
Oklahoma	182	115	11	†56	564,883	5,280	4,126	1	0	2	13	16	69	2	17	356	444
Pennsylvania-New York	41	9	17	‡15	88,194	1,352	1,355	0	0	0	0	0	0	0	5	23	28
Texas	436	270	10	156	1,909,881	10,370	9,776	23	0	0	99	122	451	46	89	2,354	2,940
Southwest (1 & 4)	55	29	3	23	235,910	1,476	1,581	1	0	0	14	15	72	22	25	404	523
Gulf Coast (2 & 3)	49	28	1	20	313,440	1,531	1,433	2	0	0	9	11	48	19	27	376	470
East (5 & 6)	24	9	2	13	106,160	544	459	0	0	0	9	9	8	0	7	159	174
North Central (7-B & 9)	177	104	0	73	576,538	3,886	3,699	14	0	0	52	66	195	4	12	962	1,173
West (7-C & 8)	109	84	1	24	603,428	2,398	2,148	5	0	0	14	19	126	0	13	405	544
Panhandle (10)	22	16	3	3	74,405	535	456	1	0	0	1	2	2	1	5	48	56
Utah	0	0	0	0	0	36	41	0	0	0	0	0	3	0	1	20	24
West Virginia	26	2	23	1	74,528	314	337	0	0	1	1	2	0	0	17	9	26
Wyoming	33	28	0	5	192,731	781	377	0	0	0	3	3	27	0	4	109	140
Miscellaneous	0	0	0	0	0	83	38	0	0	0	0	0	2	0	0	15	17
Total United States	**1,142**	641	101	400	4,476,014	30,192	27,181	31	1	8	182	**222**	809	85	210	4,901	6,005
Total previous week	985	531	100	354	3,954,846			21	2	6	158	187	778	84	202	4,719	5,783
Total July 25, 1953	1,045	525	81	439	4,182,548			26	4	10	208	248	818	63	211	5,080	6,172

Service wells included: *2, †10, ‡13.

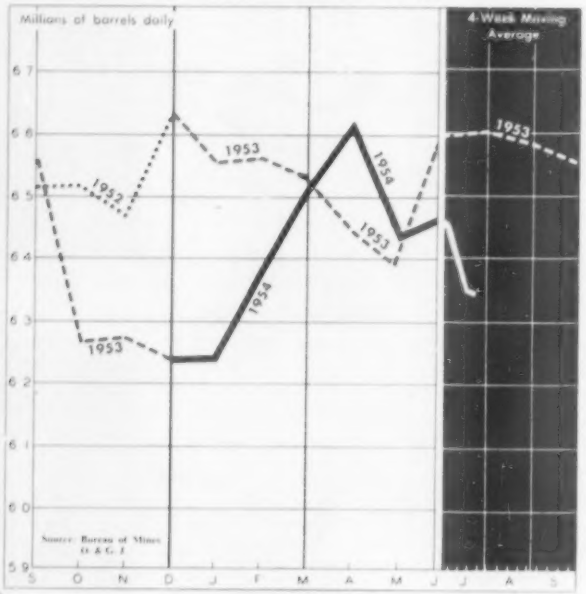
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

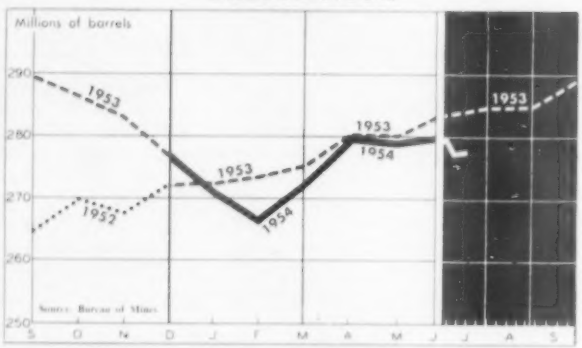


DAILY AVERAGE PRODUCTION FOR WEEK

	July 24			July 17
	Crude oil	Lease condensate	Total	total
Alabama	4,300		4,300	4,300
Arkansas	76,200	500	76,700	77,150
California	979,700		979,700	981,200
Colorado	131,400		131,400	137,000
Eastern	55,100		55,100	55,100
Florida	1,625		1,625	1,625
Illinois	174,300		174,300	188,400
Indiana	27,800		27,800	28,600
Kansas	333,700		333,700	325,100
Kentucky	34,300		34,300	36,700
Louisiana	626,500	33,500	660,000	663,200
North	106,500	3,000	109,500	112,700
South	520,000	30,500	550,500	550,500
Michigan	33,700		33,700	32,300
Mississippi	86,850	2,950	89,800	90,650
Montana	38,900		38,900	38,400
Nebraska	19,500		19,500	19,400
New Mexico	203,500	1,075	204,575	204,475
Oklahoma	500,300		500,300	502,100
Texas	2,573,000	45,500	2,618,500	2,618,500
Dist. 1	41,000	350	41,350	41,350
Dist. 2	130,200	5,550	135,750	135,750
Dist. 3	414,000	23,100	437,100	437,100
Dist. 4	232,300	5,200	237,500	237,500
Dist. 5	42,500	350	42,850	42,850
Dist. 6	108,000	4,700	112,700	112,700
East Texas field	218,000		218,000	218,000
Dist. 7-B	119,000	25	119,025	119,025
Dist. 7-C	173,000	4,300	177,300	177,300
Dist. 8	835,000	1,700	836,700	836,700
Dist. 9	178,000	200	178,200	178,200
Dist. 10	82,000	25	82,025	82,025
Utah	5,100		5,100	5,100
Wyoming	243,700		243,700	244,300
North Dakota	‡14,900		‡14,900	14,700
Total U. S.	6,164,375	83,525	**6,247,900**	6,268,300
Change from previous week, down			**20,400**	
Canada	†311,850		†311,850	†289,300
Total U. S. production January 1-July 24			1,314,439,025 bbl.	
Same period last year (crude plus cond.)			*1,337,158,168 bbl.	

*Includes 18,943,150 bbl. condensate. †Week ended previous Monday. ‡Includes S. D. 100.

CRUDE-OIL STOCKS



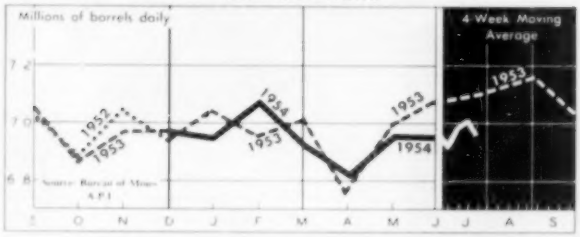
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

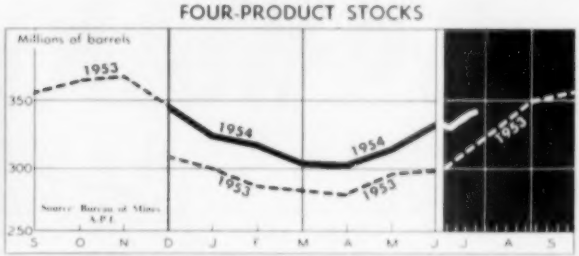
	July 17, '53	July 10, '53	July 18, '53
Pennsylvania Grade	3,165	3,203	2,549
Other Appalachian	1,762	1,808	2,629
Illinois, Indiana, Michigan	13,015	13,176	11,555
Kansas	9,465	9,415	9,256
Oklahoma	27,348	27,101	29,843
Arkansas	3,665	3,507	2,802
Louisiana	17,177	16,645	15,414
North	2,491	2,555	2,450
Gulf	14,686	14,090	12,964
Mississippi	3,281	3,294	3,724
New Mexico	8,019	7,353	7,109
Texas	129,232	129,948	134,147
East Texas proper	12,100	12,024	11,057
West Texas	54,689	55,344	63,195
Texas Gulf	28,372	28,398	26,383
Other Texas	34,071	34,182	33,512
Wyoming	13,444	13,962	13,653
Other Rocky Mountain	5,295	4,550	3,480
California	31,877	31,708	33,528
Foreign	†11,003	11,526	9,940
Total	277,748	277,196	279,629

*Bureau of Mines. †Includes 3,112,000 bbl. in California.

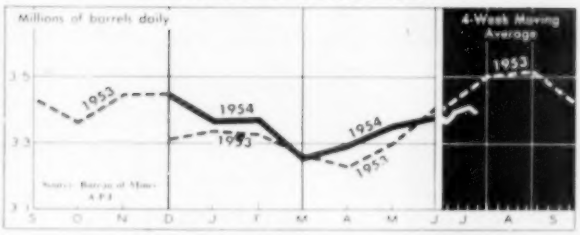
REFINERY RUNS



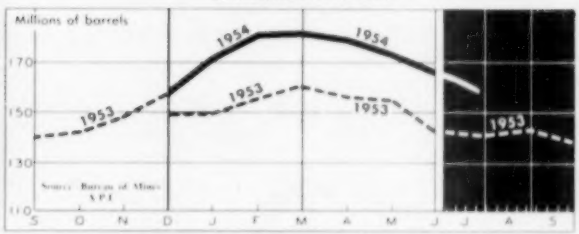
FOUR-PRODUCT STOCKS



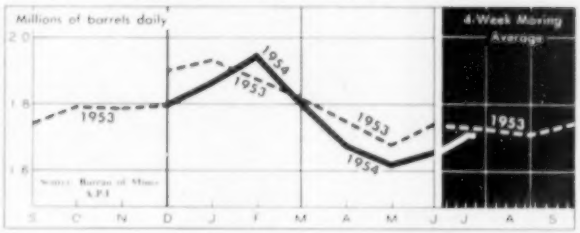
GASOLINE PRODUCTION



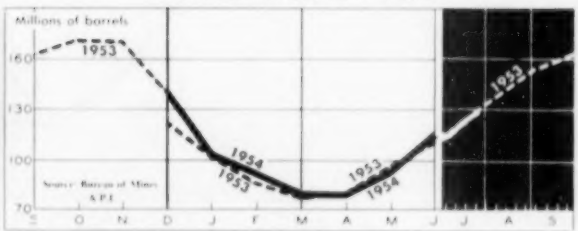
GASOLINE STOCKS



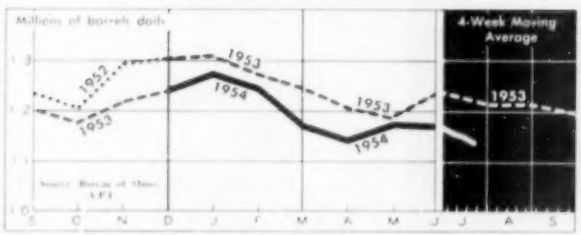
MIDDLE-DISTILLATE PRODUCTION



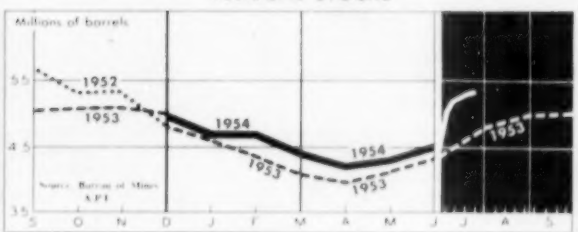
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JULY 23

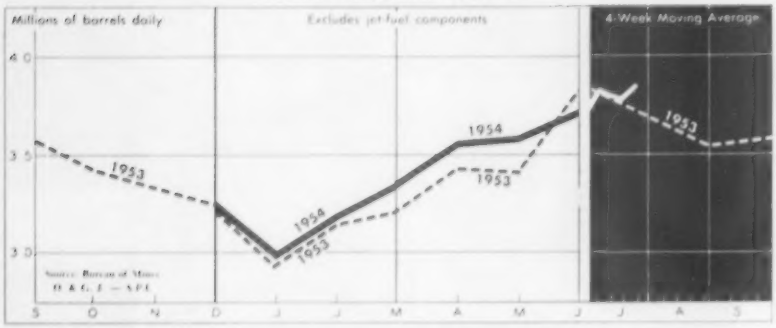
(Excludes all jet-fuel components)

(Thousands of barrels)

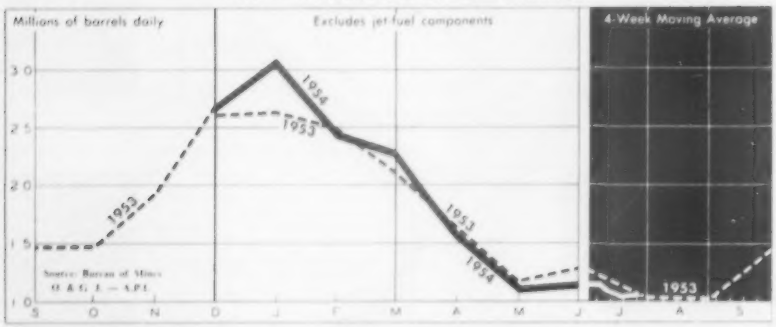
District—	Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.	Stocks‡ — Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1953 — Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.
East Coast	1,064	451.8	33.9	236.0	203.1	35,357	12,922	32,191	11,406	1,101	455.9	30.8	264.5	240.8
Appalachian:														
District 1	91	42.6	4.0	20.4	6.3	4,102	541	1,631	480	108	46.4	3.9	19.4	13.3
District 2	89	51.7	2.6	15.1	11.7	2,592	445	706	316	93	51.4	6.0	10.2	13.4
Ind., Ill., Ky.	1,288	700.4	76.0	244.7	153.4	36,311	7,269	19,539	4,816	1,295	717.2	72.1	205.3	162.7
Okla., Kans., Mo.	604	340.9	11.1	138.0	34.1	16,116	1,840	11,022	1,261	632	369.5	16.9	153.4	51.8
Inland Texas	219	171.1	11.6	41.6	25.9	5,944	439	1,832	1,274	263	189.4	10.8	46.2	35.3
Texas Gulf Coast	1,526	766.3	78.3	353.6	210.7	19,235	3,272	11,506	5,308	1,624	837.5	119.0	369.8	229.7
La. Gulf Coast	550	263.6	43.0	137.8	32.3	8,056	2,844	4,178	1,215	572	297.9	47.9	138.9	58.5
N. La. and Ark.	86	37.1	7.3	18.9	5.3	3,753	810	1,071	117	83	33.7	6.2	20.0	6.7
Rocky Mountain:														
New Mexico	19	11.9	1.0	2.9	2.9	225		66	31	20	12.8	0.4	3.7	3.3
Other Rocky Mtn.	239	110.3	2.4	58.6	31.7	7,664	275	2,350	903	242	115.1	1.7	53.4	38.8
California	999	418.7	1.7	140.4	357.6	19,489	412	12,320	26,458	1,070	456.2	5.1	156.6	369.6
July 23, 1954	6,774	3,366.4	272.9	1,408.0	1,075.0	158,844	31,069	98,412	53,585	7,103	3,583.0	320.8	1,441.4	1,223.9
July 16, 1954	6,969	3,405.3	303.1	1,440.9	1,127.9	161,786	30,318	94,794	53,355					
July 25, 1953	7,125	3,482.9	297.9	1,424.4	1,254.0	141,708	29,873	97,830	48,886					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

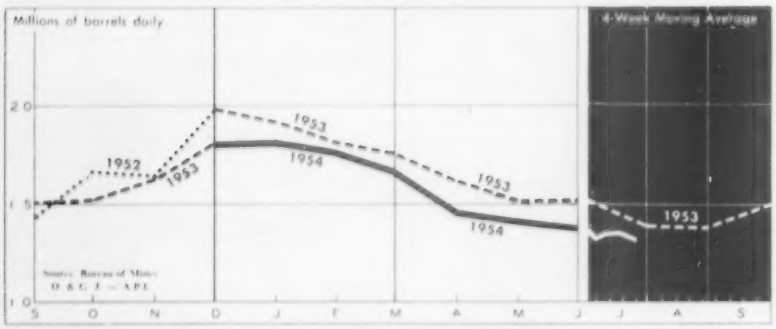
TOTAL GASOLINE DEMAND



TOTAL MIDDLE-DISTILLATE DEMAND



TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of July 28, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.5-11	11.25-12	10.25-10.5
Premium gasoline	11.5-12	13-13.75	11.25-11.5
42-44 w.w. kerosine	9-9.25	9.70-9.95	8.75-9
No. 2 straw fuel oil	8-8.25	8.70-8.95	7.75-8
No. 6 residual	$1.05-1.15	$2.05-2.25	$1.75-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4.0	3.5	3.75
Grade 18-55	4.8	4.3	4.55

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX

Mid-Continent

132-134 A.M.P.	6.0

• Through mechanical error, the price of Group 3 regular gasoline was listed last week at the Gulf Coast price. The Group 3 price is still 10.5-11 cents a gallon. But, suppliers report that the tone of the market has improved in the past week.

PRODUCTION AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 7-23-54	3,395	3,853
May 1954	3,377	3,463
June 1953	3,410	3,838
July 1953	3,501	3,690
Middle distillate:		
Four weeks ended 7-23-54	1,717	1,046
May 1954	1,673	1,169
June 1953	1,747	1,280
July 1953	1,735	1,035
Residual fuel:		
Four weeks ended 7-23-54	1,132	1,335
May 1954	1,148	1,356
June 1953	1,238	1,506
July 1953	1,224	1,390

SUPPLY AND DEMAND*

(Thousands of barrels daily)

	May 1954	May 1953
Domestic demand	6,836	6,953
Gasoline	3,368	3,361
Kerosine	157	163
Distillate	934	911
Residual	1,272	1,443
Jet fuel	108	84
Lubricants	104	111
L.P.G.	263	295
Other products	614	561
Crude loss	16	24
Exports	373	386
Gasoline	95	95
Kerosine	8	18
Distillate	70	94
Residual	84	67
Jet fuel		
Lubricants	43	34
L.P.G.	9	9
Other products	23	17
Crude	41	52
Total demand	7,209	7,339
Gasoline	3,463	3,456
Kerosine	165	181
Distillate	1,004	1,005
Residual	1,356	1,510
Jet fuel	108	84
Lubricants	147	145
L.P.G.	272	304
Other products	637	578
Crude exp. and loss	57	76
Stock change	940	785
Crude	63	—6
Products	877	791
New supply	8,149	8,124
Imports	1,021	1,096
Crude	708	703
Products	313	393
Production	7,128	7,028
Crude	6,471	6,390
Natural gasoline, etc.	657	638
Runs to stills	7,038	7,002

*Bureau of Mines.

(The schedule of selected crude prices appeared on page 409 of July 26 issue and will be printed again next week.)

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FOR SALE EQUIPMENT

FOR SALE: 20,000' 2½" seamless line 20c, and 3500' 4" o.d. and 1750' 3½" o.d. seamless line, 35c; suitable for water, either domestic or commercial. No pits. One weld per joint. Good as new. Will withstand any pressure requirements. M. J. Regan Pipe Co., Coffeyville, Kansas.

WILSON GIANT, San Juan Basin, with 2-V12 Le Roi, 131' L. C. Moore, Sub-structure, Blowout Preventer, 7¼ x 14 Pump, 5000' 4½" D.P., 10 Drill Collars, complete ready to run. P. O. Box 1826, Wichita Falls, Texas.

WILSON GIANT—Serial No. 6383. Sales Price—$6,000. Equipped with Two Waukesha 145 GK Engines in good condition. General Appearance—Fair. Rig used for Work-Over. Price includes Kelco Spinning and Foster Breakout Catheads; Stromberg - McCreary Air Starters on Engines. Brakes circulating water-cooled; Manual Friction Clutches in Transmission; Others—Jaw Clutches. Rig has Slush Pump Drive and Rotary Drive. Location of Unit—Lake Charles, Louisiana. Contact Cardwell, Houston.

WELL DRILLING EQUIPMENT. New and used spudders, rotaries, core drills. Tools, pipe, cable. Everything for well drilling. Fishing tools rented. Pressey & Son, Pueblo, Colo.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

FOR SALE: Rebuilt Streamlined Wilson "Giant," complete with 2 engine rig drive less engines. (1) 7¼ x 14 Gardner-Denver Power Pump. (1) 17½-FE Ideal Rotary Table, 54" Centers. (1) U-10 Unit Rig, complete with 2 Natural Gas Engines. (1) Complete string Rotary Tools, Model 70-B Brewster, 7¼ x 12 G-D Pump, 87' Mast Pole, 4½" Drill Pipe. Photos, Detailed Descriptions sent on request. Contact Mr. Pearson, J-S-G, Inc., 501 N.E. 26th, Okla. City. Jackson 5-6232.

WILSON ATLAS. Sales Price—$21,000.00. Equipped with two L1-600 Cummins Diesel Engines in good condition: includes pump drive, 12 PD groove sheave and V-belts. One American cathead and one plain spool cathead. Compound enclosed oil-bath. Includes one 1000 gal. fuel tank. Contact Cardwell, Houston.

FOR SALE—Bucyrus-Erie 28-L, trailer mounted—In excellent condition—Equipped with Waukesha engine, tool crane, casing tackle strut. Call or write B. W. Moore, Rt. 2, Parkersburg, W. Va., Phone 8-4037.

FOR SALE: Model "K" Cardwell tubing and rod unit complete with tubing and rod tools, mast, mounted on Ford tandem truck. Melco Drilling Company, Seminole, Oklahoma.

FOR SALE—1 used 2½"-5" x 10" Fig. 1450 Wheatley Power Pump, Ser. WBM 2060, mounted on steel base & DC to Buda motor BTH, Ser. No. 226569A. Price $2000.00. Cities Service Pipe Line Co., Bartlesville, Okla.

FOR SALE: Storage tank: 1000 bbls. 20 x 02', Cone top. Riveted. ¼ and 3/16" plate, solid condition. $500.00. M. J. Regan Pipe Co., Coffeyville, Kansas.

FOR SALE—At our Oklahoma City Warehouse, attention T. P. Mace, 1—used 4½" x 10" K Frame Worthington Side Pot Type, Hortz. Duplex Power Pump, Ser. #926421, on steel base, & V-belted to RXB, LFH, Hercules Power Unit, #122674, suitable to mud pump for conversion to mud service. Price $2000. Cities Service Pipe Line Company, Bartlesville, Okla.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units, Westinghouse 20-25-50 KW Generating Units.
H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

FOR SALE
8" Line Pipe

250,000' 8⅝" OD 28.55# Lapweld

All used #1 grade, machine cleaned, straight, 20' single random lengths, ends beveled. Suitable installation oil, water or gas pipeline systems 850 to 900# PSI. Large additional quantities same size in process, taking up and reconditioning. Priced attractively, prompt shipment, Carrollton, Mo.

Write — Wire — Phone

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Phones 2-9128 — 54-4229

FOR SALE
INGERSOLL-RAND
GAS ENGINE DRIVEN COMPRESSORS

1—	XVG-8	—350 H.P.
1—	XVG-6	—250 H.P.
1—	XVG-4	—150 H.P.

ANY COMBINATION COMPRESSOR CYLINDERS. SPECIFY INLET AND DISCHARGE PRESSURES. PROMPT DELIVERIES.

EARL E. KNOX COMPANY
TELEPHONE: 2-5204
BACON STREET, ERIE, PA.

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Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

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EMSCO GB 800 RIG

This rig fully equipped with many extras. Less than 45,000' of hole drilled with rig and accessories since new. Inventory includes grooved drum, dynamatic brake, heavy duty mast, 12 foot substructure. 2 pumps including Gardner-Denver 800 H.P. GXR, 3 LRDU Waukesha Diesel Engines, Steel Mud Tanks, 4½" Grade E Hand Banded Drill Pipe, 6¼" and 7¾" Drill Collars. This rig is priced right. For details contact

BOX H-307, THE OIL AND GAS JOURNAL, Tulsa, Oklahoma

FOR SALE EQUIPMENT

MODEL H CARDWELL Servicing Unit. Truck mounted with mast. Fully equipped. Box No. 1 or Phone 153, Canton, Kansas.

FOR SALE: 2—90 HP Twin Superior Compressors. Alfred B. Kern Co. 227 Wright Bldg., Tulsa 3, Okla.

WILSON TITAN, San Juan Basin, 2-LRO Waukesha, 131' Emsco Mast, 10' Sub-structure, 7¾ x 16 Pump, 6000' 4½" D.P., 10 Drill Collars, Blowout Preventer, see on job. P. O. Box 1826, Wichita Falls, Texas.

FOR SALE

Unit 10 and unit 15 complete power rigs in excellent condition—new drill pipe—priced reasonable—$175,000.00 in equipment used less than six months—will show or furnish inventories to interested parties.

VERNON WHITELEY DRILLING COMPANY

TELEPHONE 2-2212
TYLER, TEXAS

GOOD USED PIPE FOR SALE

229,000' of 8⅝" O.D. 23.57# .264" wall, PE BFW Seamless Line pipe, average length 32'; 98% strictly #1.

77,000' of 6⅝" O.D. 18.97# .280" wall, PE DRL L.W. Line Pipe, average length 42'; 35% fair #2, 5% #3.

12,000' of 6⅝" O.D. 17.02# .250" wall, P.E. BFW Seamless Line Pipe, approx. length 42'; 98% strictly #1.

75,500 of 10¾" O.D. 28.04# .250" wall, P.E. BFW Elec. Weld Gr. "B," 40' lengths; all strictly #1.

The above pipe located in Illinois

43,600' of 6" O.D. 9.5# .150" wall, SS & EW Line Pipe, 40' lengths; 95% #1—Magnolia, Ark.

8,000' of 24" O.D. 94.62# .375" wall, PE BFW Seamless Line Pipe, 40' lengths; 98% #1—Longview, Texas.

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Tulsa, Oklahoma

PLANT LIQUIDATION

8—Stainless steel columns: 8' x 61', 7' x 25', 6' x 64', 6' x 45' 850#, 4' x 110', 4' x 70', 2' x 73', 2' x 39'.

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2—1440 sq. ft. 304 SS exchangers.

2—1125 sq. ft. steel heat exchangers, 850#.

9—Kettle type reboilers, steel & SS 1250, 1125, 750, 660, 400 & 340 sq. ft.

58—Atmosphere heat exchanger units, 304 SS, 715, 477, 358 & 108 sq. ft.

60—Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".

2—6-stage Pacific pumps 730 GPM.

4—I.R. 8000 GPM pumps PVG-8 engines.

2—Clark MA-4 150 BHP engines.

2—Union Iron Works 30,000#/hr. water-tube boilers 200 PSI complete.

Detailed circular upon request.

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FOR SALE: New and Used Drilling Engines, 110, 140, 170 and 205 HP. Gas, Gasoline or Diesel; Under-Road Boring Machines; 3 KW DC Light Plants. Young Engine Corporation, Canton 1, Ohio. Western Repres.; A. E. Avers, Box 606, Tulsa, Okla.

Cooper E-36 double drum spudder complete with 6" x 8" x 65" double pole telt coping mast, complete with guy lines, tubing board, and rod hanger, mounted on R-190 International tandem drive truck, with dog house, light plant, butane tank and all necessary tools including rod and tubing tools ready to go to work. This unit is 14 months old. Location unit, Great Bend, Kansas. 725 N. E. 6th Street or phone CEntral 2-7443, Oklahoma City 4, Okla.

FRANKS MODEL 5000 Spudder — Serial No. 866. Sales Price—$7,500. Equipped with one Cummins HB1-600 Engine in good condition. Brake Rims in fair condition; Brake blocks—Good. General appearance—Good. Chains—Good. Basic Machine equipped with Spudding attachment, Skid and 65' Double Leg Pipe Mast with 8⅝" and 7" Pipe Legs; 4-Sheave Crown of Wilson Manufacture. Price includes Mast Guy Lines. Location of Unit — Western Kansas. Contact Cardwell, Wichita.

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Wofford Type Sampler
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12" Line Pipe

125,000 Feet—

12¾ O.D. .375 Wall
49.56 lb. Lapweld

All machine cleaned, commercially straight, 20' single random lengths, ends beveled, used, 1st class condition. Suitable installation—oil, water, or gas pipeline systems. 850# to 900# PSI. Large additional quantities, same size, process, taking up, and reconditioning. Priced attractively, for prompt shipments, Welda, Kansas, and Grandview, Mo.

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125 W. 3rd St. Tulsa, Okla.
Phones 2-9128 — 54-4229

FOR SALE EQUIPMENT

FOR SALE—1 used 2½"-5" x 10" Gaso Power Pump, Fig. 710-S. Ser. #7435, on steel base & V-belted to HXE Hercules motor. Ser. #330493. Price $2000. Cities Service Pipe Line Company, Bartlesville, Okla.

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126. Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

WILSON GIANT Drawworks, complete with catheads, pump drive, rotary drive, and 2 Buda JL-1335 Engines compounded; all ready to drill; $5000. 1254 gallon Code Butane Tank, skid mounted and good as new—$500. Ideal Type 66, 4 sheave, 160 Ton Traveling Block for 1⅛" line—$400. 48" PD, 12D groove mud pump sheave—perfect condition—$250. In contractor's yard in Ellis, Kansas. Phone AM 5-4172 or write 909 Central Bldg., Wichita, Kansas.

WILSON SUPER, San Juan Basin, 87' Mast Pole, Substructure, 3000' 4½" D.P., 6 Drill Collars, 7¼ x 12 Pump, complete rig. P. O. Box 1826, Wichita Falls, Texas.

FOR SALE—Wichtex Model X5000 Spudder complete with tools and pipe. Contact Ekco Drilling Corp. Box 1167, Graham, Texas.

PIPE FOR SALE

50,000 feet good used 8" Line Pipe .322 wall, 28.55# Lapweld, 8⅝ OD, 68c per foot. Peter Grimm, 110 Washington Ave., Stamford, Conn.

EQUIPMENT NOT IN USE: Did you find a buyer in this column for the equipment you have for sale. Someone wants it and an "Equipment For Sale" classified advertisement in the Journal will find a buyer. See box heading for classified rates or write The Oil and Gas Journal.

EQUIPMENT WANTED

AN EXPERIENCED sales organization is seeking added lines of equipment to ENGINEER and SELL to the Chemical, Petroleum and Natural Gas industries in Ohio, West Virginia, and Western Pennsylvania. Inquiries invited. Box H-285, The Oil and Gas Journal, Tulsa, Oklahoma.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1383, Tulsa, Oklahoma.

MANUFACTURERS AGENT now calling on Oil Production and Oil Refinery Accounts desires new products to introduce into this field. Territory consisting of South Louisiana and Mississippi. Write Box 102, Harvey, Louisiana.

WANTED: Skid mounted mud pump unit 7¼x14 class, preferably Diesel powered. Wire or phone B. A. Hoffman, 4222 Rawlins, Logan-1664, Dallas, Texas.

WANT EQUIPMENT: Did you find the equipment you wish to purchase in this column? If not, use an "Equipment Wanted" classified advertisement to find it. It is available somewhere and Journal classified advertisements will find it. See box heading for classified rates, or write The Oil and Gas Journal.

MATERIAL WANTED

One 13⅝" Shaffer Blowout Preventer, Type 39. One 10¾" Shaffer Blowout Preventer, Type 39.

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HELP WANTED

PETROLEUM ENGINEERS: Major oil company in South America has varied positions for single graduate engineers. Must have minimum one year each production and engineering experience. Reply giving full details—age, experience, college, military status, etc. Box H-228, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS AND CHEMISTS—With oil refining experience for positions in sales and technical service to the petroleum industry. Familiarity with fluid catalytic cracking desirable. Salary dependent upon qualifications. Please reply to Box H-312, The Oil and Gas Journal, Tulsa, Oklahoma, stating experience and salary requirements.

HELP WANTED

SOUTH AMERICA. Major Oil Company. Our fee paid. Mechanical Engineer—Petroleum Engineer—Chemical Engineer—Geologist—All requiring Degree, experienced or inexperienced. Mud Technician—two or more years' experience, single. Tool Pusher—under 40, three years' experience. Accountant—Degree, Accounting major, single. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 S. Main, Tulsa, Oklahoma. Phone 4-3193.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

SALES ENGINEERS WANTED

OIL FIELD Exploration Equipment. Leading instrument manufacturer wants men to sell $2000 electronic instrument to oil companies and geological survey companies. Instrument substantially increases chances of success in wildcat drilling. Salesmen are supplied qualified leads from national advertising campaign. Several choice protected territories open. Will only consider men with heavy experience selling to the oil industry. Must have good earnings record and thorough knowledge of oil geology. Earnings unlimited on commission basis. Write fully stating employment record, past earnings and education. Box H-290, The Oil and Gas Journal, Tulsa, Oklahoma.

DUE TO EXPANSION program large independent oil company has openings for assistants in seismic recording and computing. College graduates with at least one year of experience in geophysics desired. Ample opportunity for advancement. Give educational and previous employment details in initial letter and include photograph. All replies confidential. Box H-265, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMIC Party Chief for work in United States with degree in Geophysics, Geology, or Engineering, age 26 to 35, capable of advancing in small progressive contract seismograph company. Must be good interpreter. Salary commensurate with ability. Please include education and complete brief of experience in first reply. Replies confidential Box H-331, The Oil and Gas Journal, Tulsa, Oklahoma.

Micropaleontologist

Preferably with an advanced degree and a minimum of 5 years' commercial or academic experience. To work in New York research laboratory. This position demands broad interests in stratigraphy and biofacies and the capacity to do independent work on projects assigned.

Salary dependent on experience and qualifications. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor
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Arabian American Oil Company
505 Park Avenue
New York 22, N. Y.

CHIEF ENGINEER

Well known national engineering and construction company specializing in oil and chemical industries. Must have thorough knowledge petroleum processes and proven ability to organize and handle complete engineering department. Age preference 35-45. Headquarters Middle West. Give complete data first letter. Box H-277, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

ASSISTANT GENERAL Sales Manager for Integrated Independent Refinery. Must have satisfactory experience and general knowledge of markets. Reply should include full particulars in first letter, including resume of experience, education, references and salary expected. Box H-324, The Oil and Gas Journal, Tulsa, Oklahoma.

TRAVELLING STOREKEEPER — Excellent permanent position available for man with 2 to 5 years materials experience in the oil or gas industry. Must be willing to travel part of the time. Headquarters in Dallas. College training desirable but not essential. Age 25 to 35. We are a natural gas utility company engaged in production, transmission, and distribution in a 4 state area. We offer a full program of employee benefits. Apply by mail to: Southern Union Gas Company, Burt Building, Dallas 1, Texas. Attention: Mrs. Singer.

PERMANENT EMPLOYMENT with large organization for men to serve as Sales Engineers in electric logging. Will be stationed in large cities in operating areas to do quantitative and reservoir work with electric and radioactive logs. Must have degree in petroleum engineering, geophysics, or geology with a minimum of three years' experience, preferably both field work and reservoir study. Will be given thorough training in log interpretation. Box H-309, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Mathematical Analysis Group has openings for TWO mathematicians or physicists with advanced degrees and background in applied mathematics, numerical analysis and digital computing.

One position involves planning and supervision of numerical analysis and digital computing on reservoir engineering and petroleum production problems.

The other position involves mathematical analysis of refinery, pipe line, and exploration problems, including linear programming for optimum operations.

New laboratory building. Excellent benefits and working conditions. Address letter giving education, experience and salary requirement to Personnel Records Division, Continental Oil Company, Ponca City, Oklahoma.

EXPLORATION MANAGER: Aggressive independent oil company has opening for experienced Exploration Manager, fully familiar with Mid-Continent and Rocky Mountain Areas. Must be capable of handling all phases of land and geological operations, originating and closing deals, directing division or district offices. Graduate geologist with major oil company training preferred, between ages of 30 to 40. Excellent opportunity for right party. Do not answer unless fully qualified. In replying give past employment record, educational background, and complete personal data. Box H-330, The Oil and Gas Journal, Tulsa, Oklahoma.

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal.

SITUATIONS WANTED

FARM BOSS, age 40, competent, aggressive, experienced in production. Now employed but desires to make a change. Desires responsible position with chance for advancement. Prefer Southern area. Box H-320, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico,
Phone 3-3141.

146 Allen Building, Midland, Texas,
Phone 2-2962.

SITUATIONS WANTED

PETROLEUM ENGINEER, 29 married, 5½ years experience in production engineering and supervision with Major company. Desires responsible position in production or as engineer. Box H-289, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING AND PRODUCTION Equipment Engineer with vast foreign experience. Desires position in Colombia, will accept sales work. Travel. Speaks Spanish fluently. Box H-288, The Oil and Gas Journal, Tulsa, Oklahoma.

MARRIED MAN, 2 children, age 31, now employed in Glycol Injection and Dehydration, desires to relocate with progressive oil company. Have had experience in Well completion and production. Box H-301, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT—Heavy executive experience as chief accountant in producing and drilling operations. Qualified tax man. Desires similar position with independent operator. Box H-317, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST with extensive interpretation and supervisory experience desires employment at permanent location or foreign assignment. Degrees and advanced studies in geology and engineering. Box H-293, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER, registered professionally in Oklahoma, five years varied major company experience in drilling and production. Desire production with active independent in Rocky Mountains, Oklahoma or North Texas. Box H-313, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 4 years with major company in rotary drilling, production, lease analysis, and equipment design. Some secondary recovery. Desire opportunity with aggressive independent or individual. Box H-316, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER, 31, 9 years experience as equipment inspector with Major Oil company Box H-315, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, 30. Married. Five years subsurface and surface geological and administrative experience with major oil companies. Present position: district geologist. Box H-319, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 31, degree, single, presently employed, 6 years experience in seismic and exploitation work. Well experienced in exploitation and would prefer position in that phase with company operating in either West Texas, Oklahoma or Rocky Mountain area. Box H-329, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY PROJECT-DESIGN: Professional Engineer, years experience with leading engineering contractors, processing, estimating, sizing, rating, procurement exchangers, furnaces, fractionators, piping, instruments controls, etc. Box H-327, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES ENGINEER available for Ark., La., Tex. area. Headquarters in Dallas. Manufacturers representative basis. Exclusive territory, specialties wanted. Oil & Gas industry as well as industrial machinery. Thirty years sales experience. Have good contacts, Dallas, Ft. Worth, Houston, Shreveport. Box H-326, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ACCOUNTANT, Oil production and drilling experience, C.P.A., available soon. Top references. Box H-325, The Oil and Gas Journal, Tulsa, Oklahoma.

COMPLETE GEOLOGICAL Force or less Geologist, 35 years old, married, 3 children, has had own consulting firm for past 6 years doing research, evaluation, consultation, and well logging work for major and independent companies. Presently have a staff of ten geologists. Would like to make arrangements with a financially able company to transfer all personnel including self as a complete geological department or district department or according to company's convenience. To locate anywhere. Will also turn over $40,000 worth of logging equipment and $100,000 worth of files and map information for company use in exchange for employment on a long term or permanent basis. Will consider a single arrangement including only self or a smaller number of my personnel. Have major company experience in Rocky Mts., Texas. Am perfectly capable of handling all phases of administrative work. Box H-314, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST—6 years Major Company experience in exploration, exploitation and evaluation, desires position with firm headquartering in the Dallas, Ft. Worth area. Box H-284, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ENGINEER—Geologist—Age 34, Married, 10 years active, varied petroleum engineering, exploration geology, and management experience with major and substantial independent in Mid-Continent and Gulf Coast. Desires responsible position with small or medium size independent exploration and production company, having capacity for substantial growth. Box H-302, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, nineteen years top staff experience, available with reasonable notice. Box H-322, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 35, married, 7½ years diversified drilling and production experience with major company in Texas and New Mexico. Licensed Professional Engineer. Desire responsible position with independent as either production supervisor or engineer. Box H-321, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—seven years experience Southwest, desires location with independent company. Box H-318, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL PROPERTY MANAGEMENT Engineer with broad experience in geology and all phases of exploration and production desires to represent and handle operations for small oil company or individual in Mid-Continent area on full or part time basis. Box H-292, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 28, family, employed 2½ years with major as reservoir engineer, last three years with independent in charge of production, costs, completion and remedial operations, desires to locate in Oklahoma or north Texas with independent. Top references. Box H-305, The Oil and Gas Journal, Tulsa, Oklahoma.

THE RIGHT MAN: Can you fill the position you have open from the qualifications listed in this column. Men are always looking for an opportunity to improve themselves. Use a "Help Wanted" Journal classified advertisement to find the men you need. See box heading for classified rates or write The Oil and Gas Journal.

BUSINESS OPPORTUNITIES

WANTED BY reputable mining engineer and geologist of Los Angeles, one or two persons to join me in forming small closed co-partnership for purpose of locating and mining uranium ores in California and Arizona. Box H-323, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Partner to finance pilot plant and share equally in development of new Secondary Recovery of Crude Oil Process—patent pending. Five figure investment. G. Auer & Associates, P. O. Box 25, Princeton, N. J.

FOR SALE: Well established tank company, doing business of erection, dismantling and repairing large storage tanks. Located in Tulsa County. Write H. O. Jones, Box 2297, Tulsa, Okla.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 467, Wilmington, Delaware.

REAL ESTATE

SPACE IS NEEDED: A Journal display classified advertisement is the quickest way to rent or sell your real estate. In the present period of expansion oil industry firms urgently need the space you have available. If it isn't listed here, you may also find it by stating your needs in these pages. For classified rates see box heading or write The Oil and Gas Journal.

MIDLAND, TEXAS

For immediate sale, corner lot, 100 x 140 in Business District, 2 blks. N. of McClintic Bldg. Outstanding opportunity to secure ideal location for growing oil company's offices. Write owner: D. Amfitheatrof, 718 14th St., Santa Monica, California.

ROYALTIES

QUOTE ME your highest price for one-half of two-thirds interest royalty out of 96.6 acres, J. C. Stewart Survey, Abstract #1880, Section 2, Block C, known as the J. W. Burnett Subdivision Estate, Young County, Texas. Lessee to pay for title check. P. O. Box 722, Clifton, Arizona.

FOR SALE: Landowners royalty on four-hundred acres in West Sage Stouctune, Big Horn County, Wyoming, one mile from production. Leased to Major Company. Box H-328, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED TO BUY Producing Royalties. Submit full particulars for our engineer's approval, including payments, plat, etc. Box 276, Rutherford, N. J.

OFFERING CHOICE PRODUCING oil income royalties with large reserves per Dollar investments. A. S. Berry, 522 Wright Bldg., Tulsa, Okla.

JACK EAGLE, Oil Properties, 706 City Nat'l Bldg., Oklahoma City, Oklahoma. Telephone REgent 6-7027.

GET TOGETHER: Both Capital and Royalties are available. If the investment proposition you want isn't listed in this column, use a Journal classified advertisement to find it. See box heading for classified rates, or write The Oil and Gas Journal.

URANIUM

87 Uranium claims with the right count. Exploratory shaft. Will withstand rigid investigation. $50,000 for quick sale. Bryant Ferguson, 705 N. Main, Carlsbad, New Mexico.

OIL FORMS

KRAFTBILT FORMS, designed especially for the oil industry, are popular because they are efficient, economical. For all production-reporting forms, plat sheets, all administrative forms, columnar pads, truck reports, material transfer forms, ask for Catalog 854-K. Ross-Martin Co., P.O. Box 800-A, Tulsa, Okla.

LOST AND FOUND

REWARD FOR RETURN OF DIAMOND CORE BIT: Lost one 6¾ by 1¾ HH-40 Wire Line Diamond Core Bit, Serial No. UC-2 containing diamonds weighing 390.32 cts. Reward for information leading to recovery. Box H-311, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS MEASUREMENT SERVICES

GAS CHARTS INTEGRATED

SERVING CUSTOMERS IN 14 STATES. FAST RETURN SERVICE.

A sure and economical method of obtaining gas volume computations. Send one chart or 10,000. Write or 'phone for further information.

JOHN P. SQUIER CO.

P. O. Box 6100, Dallas 22, Texas
'phone Woodlawn-4484

LEASE AND DRILLING BLOCKS

350 ACRE LEASE. Five shallow producing wells now averaging 75 barrels. Burkett, 3455 Jonnette, Shreveport, La.

FOR SALE: Oil producing properties in Pontotoc County, Oklahoma. Box H-291, The Oil and Gas Journal, Tulsa, Oklahoma.

SAN JUAN BASIN Southern Colorado acreage on anticline near production and geologically mapped. If you are interested in good farm-out block write or call N. O. Yeakley, 2938 Osage SW, Albuquerque, New Mexico, Phone 3-3993.

GAS COMPANY desires to purchase producing or shut-in gas properties. Also desirous of drilling proven or wildcat gas prospects. Replies confidential. Box H-310, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

WILL LEASE 112 acres Mary E. Criswell Survey, Abstract #1772, Section 2, Block C, known as the J. W. Burnett Subdivision estate, Young County, Texas. This acreage once good producer, initial production 60 barrels per hour; total depth 4,108 feet. Well completed October 2, 1943; well plugged August 21, 1944. Will lease for $10.00 per acre, one, two or three years. Lessee to pay for title check. P. O. Box 722, Clifton, Arizona.

320 ACRE Producing Oil Lease offsetting Viola and Hunton production. Strahm pool. Nemaha County, Kansas. Small Hunton well. Excellent prospects Viola. Cheap. R. D. Swan, 1006 Daniel Bldg., Tulsa, Okla.

MONTANA MINERALS FOR SALE—20 to 200 acres at $10.00 per acre. Under 1766 surface acres, leased at $1.00 rental. Carter County. Write for particulars. N. R. Brasted, 816 Sinclair Bldg., Fort Worth, Texas.

PRODUCING Water Flood Property. Total 320 acres, one-third developed. Produced 25,000 bbls. last twelve months. $50,000.00 worth of operating equipment. Seven producing wells. For sale at bargain of $125,000.00. Contact Mr. Roger H. Davis, 220 Mercantile Commerce Building, Dallas, Texas.

WILL pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LOOKING FOR A LEASE? There will be over 40,000 wells drilled this year. If you are looking for a lease, drilling block, or drilling deal and you haven't found it in this column, or if you have a lease or drilling block you want drilled, a Journal classified advertisement can find an interested party. See box heading for classified rates, or write The Oil and Gas Journal.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis 5, Mo.

WILDCAT COMPLETIONS

(Continued from page 150)

KANSAS

Barber County: Rupp-Ferguson 1 Dickenson est., NE NE NE 22-31s-15w. Dry. TD 4,922 ft.

Clark County: Shamrock 1 Randel "D," SE SE NW 28-32s-1w. Dry. TD 5,464 ft.

Cowley County: Saco Church, SW SE SW 13-31s-6e. IPP 10 BOPD, Mississippian 2,947-54 ft. TD 2,954 ft. (Opens Church pool.)

Rex & Morris 1 Cunningham, SW SW NW 23-31s-6e. Dry. TD 3,020 ft.

Saffa Oil Co. 1 Jarvis, NE NE NE 27-33s-7e. Dry. TD 2,979 ft.

Ellsworth County: El Dorado Refining Co. 1 Brown, NE SE 1-17s-9w. IPP 205 BOPD, Lansing 3,046-50 ft. TD 3,267 ft. (Opens Green Garden pool.)

Ford County: Coppinger 1 Davis, SW SW NE 15-28s-21w. Dry. TD 5,229 ft.

Greenwood County: Crow & McLane 1 Glasco, SE NE SW 11-28s-10e. Dry. TD 2,528 ft.

McPherson County: Shelley-Miller 1 Rupp, SW SW SW 13-21s-2w. Dry. TD 3,029 ft.

Osage County: Barbara Oil Co. 1 Ramshaw, SW NW NE 15-16s-17e. Dry. TD 1,960 ft.

Pratt County: Lario Oil & Gas Co. 1 Woolfolk, SW SW SE 15-28s-14w. Dry. TD 4,640 ft.

Skelly Oil Co. 1 Hogard, NE SE NW 15-29s-15w. Dry. TD 4,865 ft.

Stafford County: Champlin Oil & Refining Co. 1 Parks, NW NE NE 2-23s-14w. Dry. TD 3,977 ft.

WILDCAT COMPLETIONS

Schock, SW NW 17-131n-69w. Dry. TD 3,942 ft. granite.

Williams County, Northwest Tioga: W. H. Hunt 1 Gohrick, SE SE 5-158n-95w. IPP 85 BOPD, Madison discovery, new field. TD 8,396 ft. Madison.

CALIFORNIA

Contra Costa County: Lightning Gas & Oil Co. 5 Almond, 31-2n-2w. Dry. TD 5,000 ft.

Fresno County: Highland Oil Corp. 1 Dell, 29-12s-14e. Dry. TD 5,596 ft.

Kern County: Hancock Oil Co. 34-24-M JM&M-C.C.M.O., 24-25s-18e. Dry. TD 4,836 ft.

R. F. Oakes et al. 1 Jeppi, 8-29s-29e. Dry. TD 4,050 ft.

Shell Oil Co. 28X-26 Hopkins Fee, 26-27s-19e. Dry. TD 2,550 ft.

Standard Oil Co. of California 75-16Z Spreckles, 16-30s-22e. Dry. TD 5,534 ft.

The Texas Co. 1 Arvin Unit-3, 26-31s-29e, IPF 10 BOPD and 102 bbl. water, 14/64-in. choke, perfs. 5,534-6,229 ft., TD 6,232 ft. (Approx. ⅜ mile east extension to Arvin field).

Western Gulf Oil Co. 1 Houghton, 29-29s-26e. Dry. TD 9,384 ft.

Wilrich Development Co. 1 C.C.M.O., 30-28s-20e. Dry. TD 1,317 ft.

Kings County: Norris Oil Co. 3 Hand, 29-24s-18e. Dry. TD 1,310 ft.

San Benito County: W. W. Holmes, Oper. 1 Standard-McCray, 25-16s-11e. Dry. TD 1,895 ft.

Tulare County: Geochemical Surveys 77-10 Bendetti, 10-24s-24e. Dry. TD 7,238 ft.

Tule River Syndicate 1 Andrews-Prestage, 32-21s-27e. Dry. TD 1,530 ft.

Yolo County: C.K.M. Oil Co. 1 Mast, 35-11n-1w. Dry. TD 3,800 ft.

MONTANA

Hill County, Hogeland area: Amerada Petroleum Corp. 1 Lenhard, C SW SW 13-36n-16e. Dry. TD 4,210 ft. Madison.

Liberty County: Amerada 1 Skierka, SE SW SE 11-28n-6w. Dry. TD 2,700 ft. Madison.

Pondera area: Western Oil Co. 1 Bills, SW SE SW 31-28n-6w. IPP 50 BOPD, Sun River dolomite discovery, new field. TD 3,410 ft.

Rosebud County, South Porcupine: Cyprus Mines 1 Government, C SW NW 26-8n-39e. Dry. TD 4,100 ft. Heath.

WYOMING

Big Horn County, Southeast Foster Gulch: Sinclair Oil & Gas Co. 1 Government, SW SE NE 1-53n-96w. Dry. TD 13,312 ft. Tensleep.

Sheridan County, Ash Creek: C.M.&W. Drilling Co. and Montegna 1 Demple, C NW SE 28-58n-84w. Dry. TD 5,235 ft.

Sublette County, East LaBarge: British-American Oil Producing Co. 2 Government-Hutchinson, NW NW NE 33-27n-112w. Dry. TD 3,441 ft. Hilliard.

COLORADO

Adams County: Ryan Oil Co. 1 Shick, SE SE SE 3-1s-58w. Dry. TD 5,919 ft.

Logan County: Continental Oil Co. 1 Soloman, C SW SE 9-7n-55w. Dry. TD 5,516 ft.

Rex Monohan and H. E. Zoller and Fallon Gas Corp. 1 State, NW SW NW 16-9n-53w. Dry. TD 4,950 ft.

Morgan County: H. L. Hunt 2 Huey et al., C NW SE 19-2n-56w. Dry. TD 5,340 ft.

National Associated Petroleum Corp. 1 Bornhaft, SW SW SW 14-4n-58w. Dry. TD 6,078 ft.

Petroleum, Inc., 1 Schwindt, C SW NE 13-3n-59w. IP 4,932 M.c.f. of gas per day. TD 6,010 ft. "J" sand.

Sharples & Exploration Drilling Co. 1 State, NE NE NE 21-5n-55w. Dry. TD 5,225 ft.

Wytex Service-Ryan & Davis 1 Davie, C SW SE 11-2n-55w. Dry. TD 5,210 ft.

Washington County: Braden-Hoover and Kejr 1 Kejr, SW SW NW 10-2s-56w. Dry. TD 5,245 ft.

Fred M. Manning 1 Viggo-Smith, SW SW NE 29-1s-55w. Dry. TD 5,064 ft.

MANITOBA

Madison 11-12 Ebor, LSD 11, 12-9-29w1. Miss. oil well. TD 3,099 ft.

SASKATCHEWAN

Socony-Sohio 13-13 Congress, LSD 13, 13-9-1w3. Dry. TD 5,680 ft.

Hudson's Bay-Canada Southern 1 Denzil, LSD 16, 22-38-27w3. Dry. TD 2,999 ft.

British American-Husky-Phillips 12-12 Kendal, LSD 12, 12-14-12w2. Dry. TD 3,772 ft.

Socony-Sohio 13-13 North Ormiston, LSD 13, 13-10-26w2. Dry. TD 8,070 ft.

Socony-Woodley-Southern 28-3 Premier, LSD 3, 28-14-18w3. Dry. TD 5,310 ft.

Amurex-Canada Southern 1-6 Rudd, LSD 6, 27-13-28w3. Medicine Hat gas well. TD 1,670 ft.

British American-Husky-Phillips 9-11 Trossachs, LSD 9, 11-8-17w2. Dry. TD 5,107 ft.

Tide Water 2-4 Waldeck Crown, LSD 2, 4-16-12w3. Dry. TD 3,858 ft.

ALBERTA

High Crest et al 2 Atlee, LSD 15, 16-21-7w4. Sunburst gas well. TD 4,300 ft.

Triad-Anglo-Seaboard 17-16 Forestview, LSD 16, 17-74-23w5. Dry. TD 9,260 ft.

Seaboard-Banff 1-9 Knee Hill, LSD 1, 9-35-26w4. Dry. TD 8,125 ft. (Prev. reported as indicated Viking oil well; after production tests the well has been abandoned.)

Tellington 1, SE¼ LSD 11, 36-49-2w4. Sparky oil well. TD 2,055 ft.

New British 1 Pakowski, LSD 6, 28-5-8w4. Dry. TD 2,245 ft.

Union-Imperial 10-34 North Vimy, LSD 10, 35-58-25w4. Dry. TD 3,956 ft.

NORTHWEST TERRITORIES

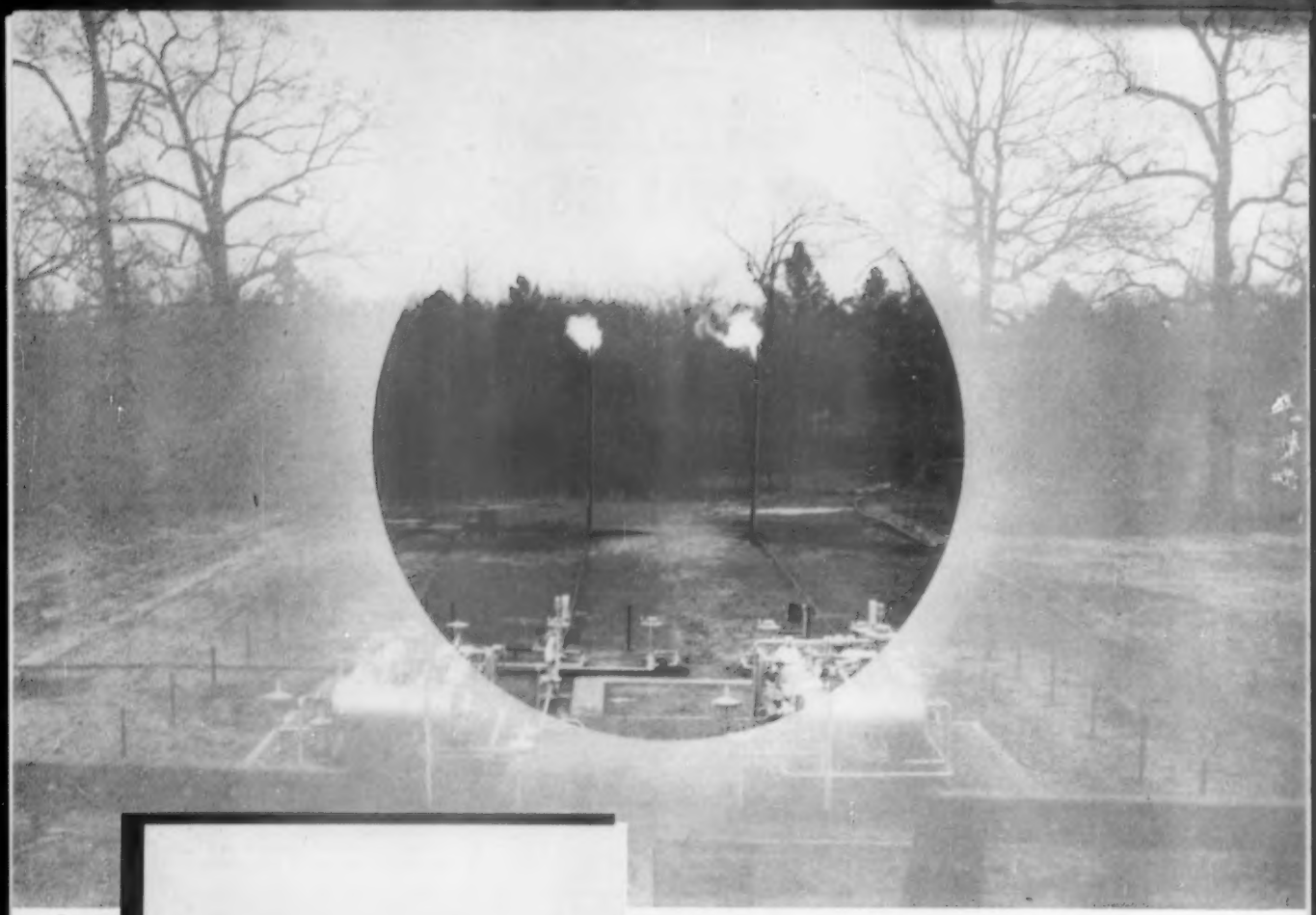
Imperial 1 Island River, Unsurveyed territory. Dry. TD 8,233 ft.

BRITISH COLUMBIA

Pacific 3 Buick Creek, Unsurveyed territory. Suspended Nikanssin oil well. TD 4,122 ft.

ADVERTISERS IN THIS ISSUE

Aerofin Corporation 117
Allen Foundry & Machine Works, Inc. 136
American Locomotive Company 33
American Telephone & Telegraph Co. 24
Anchor Petroleum Company 52
Baird Mfg. Co. 120
Baker Oil Tools, Inc. 50
Bethlehem Steel Co. 67
Bucyrus-Erie Co. 28
Cable Engineering 144
Caterpillar Tractor Co. 5
Chain Belt Co. 32
Charles Machine Works, The 120
Chicago Bridge & Iron Company Inside Front Cover
Clark Bros. Co., Division of Dresser Operations, Inc. 22, 23
Classified Advertising 159, 160, 161, 162
Continental Supply Co., The 18, 19
Crose Manufacturing Co., Inc., M. J. 72
Crossley-Premier Engines, Ltd. 117
Darling Valve and Mfg. Co. 39
Dean Brothers Pumps, Inc. 117
Dominick & Dominick 142
Dow Chemical Company, The 124
Dowell Incorporated 133
Drilling & Service, Inc. 143
Edward Valves, Inc. 36
Falcon Products, Inc. 26
Fleet-Line Co. 116
Fluid Packed Pump Company 147, 148
Fluor Corporation, Ltd., The 13
France Packing Company 116
Gaso Pump & Burner Mfg. Co. 11
General Electric Co., Electronic Dept. 45
Globe Steel Tubes Co. 29
Goodrich Company, B. F. 3
Grancell, I. H. 119
Grove Regulator Co. 20
Guiberson Corporation 38
Gulf Oil Corporation 27
Halliburton Oil Well Cementing Co. 9, 47
Houston Contracting Company 126
Hughes Tool Co. Back Cover
Inferno Co., The 119, 135
Interstate Electronic Supply Corp. 144
Iverson Supply Company 15
Johnston Pump Company 42
Jones & Laughlin Steel Corporation Supply Division 12
Keasbey & Mattison Company 8
Kewanee-Ross Corporation 40
Klinger Limited, Richard 71
Lane-Wells Company 118
Larkin Packer Company, Inc. 69
Macco Oil Tool Co. 135
Martin-Decker Corporation 6
Mayo Hotel, The 116
McDonald Company, B. F. 126
Minneapolis-Moline 37
National Airoil Burner Co., The 115
National Supply Co., The 14, 15
National Tank Company 164
New York Belting & Packing Co. 18, 19
Nordberg Mfg. Co. 108
Norris Manufacturer, Inc., W. C. 48
Oil and Gas Journal, The 115, 128
OPW Corporation 7
Pacific Lumber Company, The 121
Page Fence Association 44
Parco Company, The 120
Parkersburg Rig & Reel Co. 16
Peerless Supply Co. Inc. 110
Penn Controls, Inc. 141
Pittsburgh Lectrodryer Corporation 21
Pittsburgh Plate Glass Company, Industrial Paint Division 17
Protek Specialty Company 144
Ratigan, Inc., J. P. 144
Rector Well Equipment Co., Inc. 120
Reed Roller Bit Company 2
Republic Steel Corporation 35
Ross-Martin Co. 120
Ryerson & Son, Inc., Joseph T. 46
Scott-Rice Company 120
Shand & Jurs Co. 10
Snare Corporation, Frederick 143
Spang-Chalfant Division of The National Supply Co. 14, 15
Standard Oil Co. of California 34
Steel Forgings, Inc. 116
Superior Combustion Industries, Inc. 31
Taylor Forge & Pipe Works 130
United States Steel Corporation 4
United Supply & Manufacturing Co. 106
Viking Pump Co. 44
Visco Products Co., Inc. 65
Wagner Electric Corporation 30
Warren Petroleum Corporation Front Cover
Watson-Stillman Fittings Division H. K. Porter Company, Inc. 114
Web Wilson Oil Tools 43
Well Equipment Mfg. Corp. 41
Witte Engine Works Oil Well Supply Division, United States Steel Corporation 4
Wood's Sons Co., T. B. 126
Youngstown Sheet and Tube Company Inside Back Cover



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WASTE IS HELD TO THE MINIMUM WITH

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Heat in base of "LTX" Separator gives advantages NOT obtained by use of "LTG" (Low Temperature Glycol) Separator with no heat in base.

1. LTX means maximum high pressure gas sale, minimum low pressure gas waste, and maximum stock tank liquid recovery per unit volume of well effluent produced.
2. LTX means ability to operate without glycol injection.
3. LTX means ability to operate with glycol injection at minimum cost.
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*T. M. Reg. U. S. Pat. Off.

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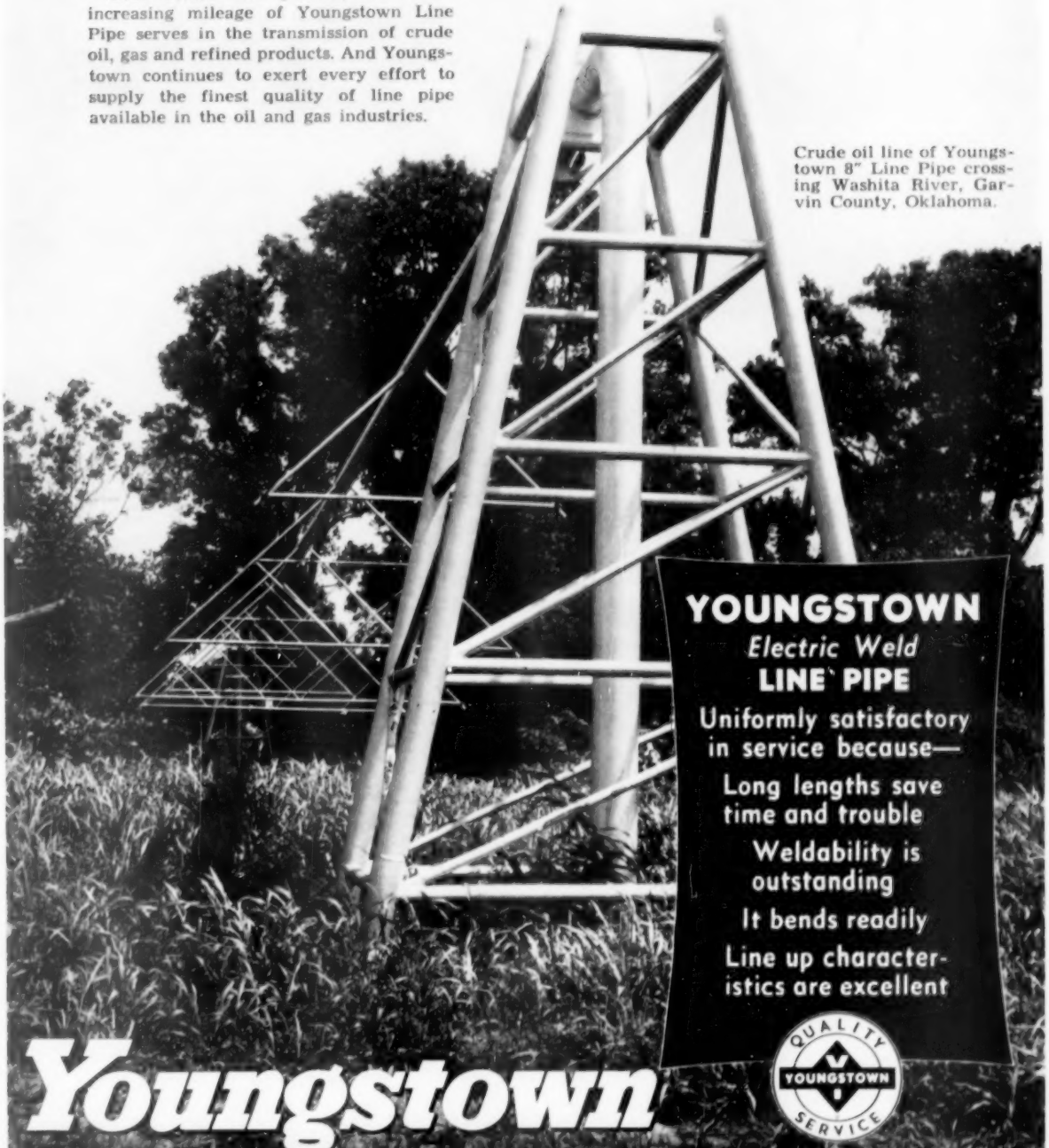
NATIONAL TANK COMPANY

TULSA, OKLAHOMA

1-5-54

Yes, it's Youngstown

Over rivers and plains, an ever-increasing mileage of Youngstown Line Pipe serves in the transmission of crude oil, gas and refined products. And Youngstown continues to exert every effort to supply the finest quality of line pipe available in the oil and gas industries.



Crude oil line of Youngstown 8" Line Pipe crossing Washita River, Garvin County, Oklahoma.

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Electric Weld
LINE PIPE

Uniformly satisfactory in service because—

Long lengths save time and trouble

Weldability is outstanding

It bends readily

Line up characteristics are excellent

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Youngstown

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Our interests are the same

...getting your well down in shortest possible time!

HUGHES research and the combined efforts of the HUGHES field organization* have *one purpose* . . . giving you bits that will get your well down in the least possible time . . . and at the least possible cost.

The HUGHES man responsible for servicing your rig knows from actual field experience the bits that will give you the fastest penetration and most footage in the formations you are likely to encounter. And you can depend on him to have the right bits on your rig at the right time.

**A field organization of over 400 serves the industry in the United States and Canada*